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HANDBOOK FOR
ARCHITECTS  BUILDERS
PUBLISHED
UNDER THE AUSPICES
OF THE
Chicago Architects' Business Association
VOL. VII, 1904

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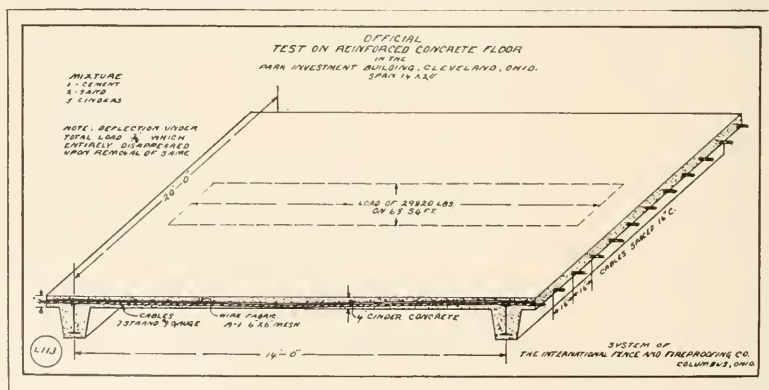
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PUBLISHED UNDER THE AUSPICES
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1904

SEVENTH YEAR

CHARLES R. ADAMS

EDITOR

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PREFACE



IN this, the seventh volume of the "Handbook for Architects and Builders," many changes will be found in the Building Ordinances. Classes 4 and 5, which include "Assembly Halls, Places of Worship, Schools, Theaters, etc.," have been revised and passed by the City Council; Fireproofing and other classes have been so amended that careful study will be necessary on the part of those interested in their requirements. The Tene-ment House Ordinance seems to be working satisfactorily, so that, with the exception of removing the sections coming under the jurisdiction of the Health Department, little, if any, change is made. It is proposed by the Building Department to re-ar-range the ordinances with the view to better the classifications, but it is feared this will not be accomplished before this volume is issued, however the ordinances as passed by the City Council, to date of going to press will be inserted in the best possible way, in this edition. The more simple and comprehensive the arrangement of the ordinances, the better for all concerned.

Attention is drawn to the Ordinance governing "Sidewalks and Vault Covers," which is published for the first time as amended; it is an important matter and a place is gladly given to it. The "Lien Law," in operation from July, 1903, is still new to many users of this book, and it is again inserted as valuable information. Important additions are made to the items connected with weights and measures, and data incidental to "Brewery" work are added.

Papers on "Asbestos," "Iron Construction," "Varnishes," "The Modern Store Front," "Magnesite Construction," "The Architect—His Rights, Remedies, Duties and Responsibilities," and other practical matters of every-day interest are given prominence and are worth reading and study.

Extended tables of safe loads for "White and Yellow Pine" are inserted and will be found exceedingly useful and time-saving. They have been most carefully worked out, and may be accepted as authentic.

The lists of City Officials, Members of the Municipal Art League, Civil Service Commission, Licensed Architects, Illinois Chapter of the American Institute, Chicago Architects' Business Association, Architectural Club and other organizations, are inserted and corrected to time of going to press.

It is impossible in this introduction to enumerate all the features of information in this year's issue; suffice it to say that the enquiries for the Handbook from every State of the Union, have been such that no opportunity to meet the requirements of the many users of the work is allowed to slip by. Again, thanks to the advertisers who have made this possible.

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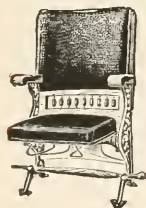
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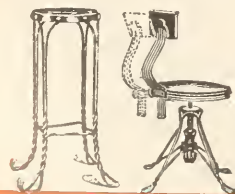
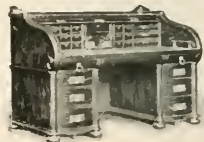
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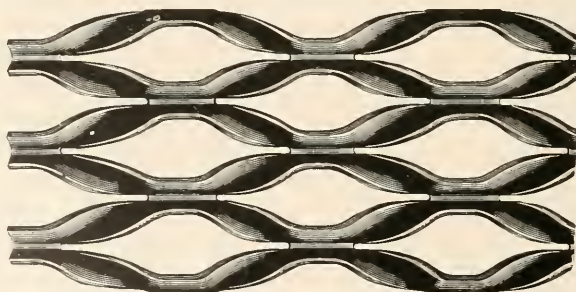
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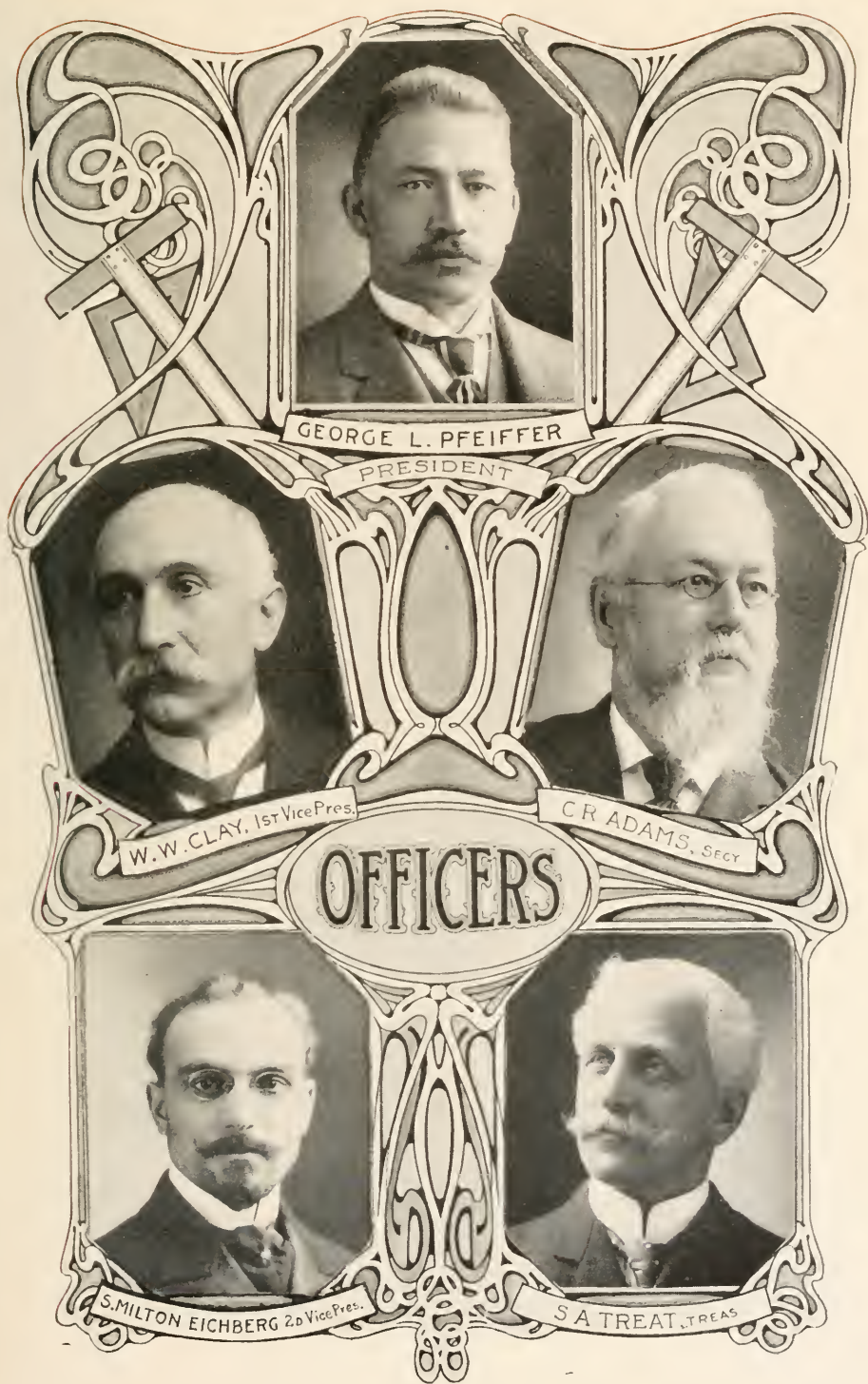
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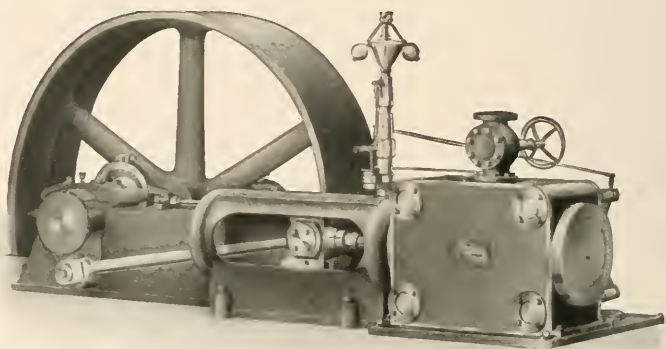
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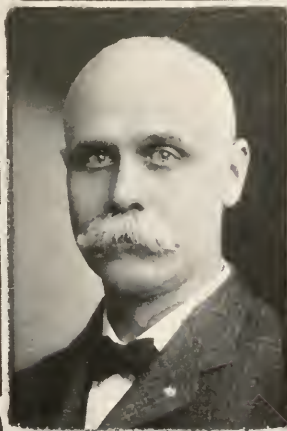
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On January 12, 1897, the association came into existence, its object being "to promote the business interests of the Architects of Chicago," and even as early as February 2 of the same year its entity was recognized by building communities who took the organization into confidence and freely consulted with it upon subjects of interest to both sides. It is noted, with much satisfaction, that the interchanges of ideas have continued to the present time, and the policy of conservatism adopted and adhered to has proved of mutual advantage. It is interesting to note that the plan of action outlined at the inception of the association has been accomplished (with one exception), and the results have justified the efforts put forward to achieve them. As time rolls by, new matters are constantly presenting themselves and are as often considered and acted upon. It is to be regretted that the desire of the association to frame and carry through such a "lien law" as would be acceptable to all parties could not be consummated, and this is the "one exception" referred to. The "lien law" introduced by the Illinois Lien Law Association, which was composed of some twenty organizations, including this association, had to give place to a statute introduced under the auspices of those interested in the sale of material; and became a law on July 1, 1903.

It is too early to speak of the working of it. It has been passed and must stand trial. Anent this "new law" a very valuable paper by the Hon. Charles N. Goodnow was read before this association on April 12 of this year. In this paper so many matters defining the duties, responsibilities and position of the architect are treated, that by permission of the author of it, it is given in full; it deserves, and should have, most careful consideration.

Following along the lines of providing valuable information for architects at every meeting of the association, the committee on entertainment procured the services of gentlemen well qualified to speak upon the several subjects allotted to them. Papers were read by Mr. Normand S. Patton on "Office Hours;" by Mr. L. J. Mensch, "Hennebique System of Armored Concrete;" Mr. T. G. Younglove, "Asbestos;" Mr. A. F. Woltersdorf, "The Modern Store Front;" Mr. F. Baumann, "Building Ordinances;" Mr. E. D. Weary, "Magnesite Process of Fireproofing," and several of the above will be found either in full or abridged in this volume. Mr. Patton also spoke upon the propriety of the Architect being employed to superintend and carry out the interior decoration and the furnishing of buildings, and the idea was unanimously endorsed.

The year 1903 closed upon a dire catastrophe, the fearful conflagration and loss of life at the Iroquois Theater. The public action committee at once took the initiative and in company with authorities from the City Hall on January 1, 1904, made an exhaustive examination of the burned interior of the building, and the committee was invited by his honor Mayor Harrison to join other organizations in prosecuting the inquiry into the causes of the disaster, and worked for many days early and late in arriving at a decision.

The association banquet which it was proposed to hold annually in January was omitted this year in deference to the Iroquois Theater calamity.

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The public action committee also took part in discussions relating to "Sidewalks and Vault Covers." The ordinance, epitomized, is inserted.

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In September of 1903, reflections were cast on this association by allying some of its members with the actions of the so-called "plumbing pool," and the matter was immediately brought before the members and a public disavowal through the press was the result.

The question of admitting associate members to the association has been considered and relegated to the "file," from which it may in the near future be taken and consummated. Inasmuch as the relations of the association are closely linked with everything connected with real estate and building, the matters involved are entitled to due consideration.

At a meeting of the association held in 1903 a committee consisting of Messrs. P. B. Wight and Charles N. Goodnow were requested to frame the following proposed changes to sections 36 and 145 of the Building Ordinances of the City of Chicago. In section 36 it was suggested to insert "and the construction of all buildings or parts of buildings, and alterations or reconstructions, erected from such plans shall be supervised by licensed architects."

It was also proposed to change section 145 as follows: "Dividing walls will be required in buildings of Class 1 as follows: For buildings of ordinary construction if their floor area exceeds 9,000 square feet; for buildings of slow burning or mill construction if their area exceeds 12,000 square feet. In each of the before mentioned cases such buildings shall be subdivided by brick walls built of the thickness given in the table for thickness of enclosing walls, and all doors and other openings in such walls shall have iron doors or shutters on each side of same. And the buildings so subdivided shall be treated as regards stairs and fire-escapes the same as two or more separate buildings." The late Alderman Mavor presented these resolutions to the City Council, and, as is usual in such cases, they were referred to the judiciary committee, who recommended that they be placed on file. It is now thought advisable to attempt to bring the matter again before the council, and the public action committee has been requested to use every effort to make the issues live ones.

It may be opportune to remark at this point that there are few if any matters which affect the architectural profession which escape the cognizance of the association, and consideration is immediately given with the view to advance not only the interests of the individual members of the association but of the profession at large, and it is much to be deplored that every architect of the city, whether engaged in erection of palatial homes, office or other extensive buildings, or in the planning and erecting of modest homes or small flat buildings, does not identify himself directly with the association to the extent of at least becoming a member of it. The association is averse to anything and everything contrary to the practice of architecture in its highest interpretation, as an honorable and ennobling profession. The association puts itself upon record as in favor of honest practice and of the execution of the building laws in their entirety without fear or favor.

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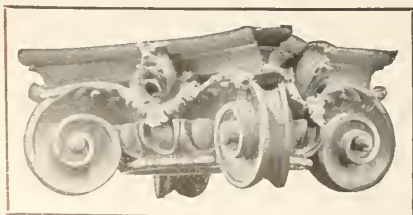
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SCALE DRAWINGS.

Section 1. All portions of the work that require a larger scale to illustrate the same shall be drawn full size or to a scale large enough to make them fully set forth what is required by the Architect. No Architect shall ask for bids on any work until all general drawings are complete and sufficient details made, which in connection with the specifications will settle all questions affecting the cost of work.

SUPERVISION OF WORK.

Section 1. The supervision of an Architect shall be such as shall require the faithful execution of the work according to the true meaning and intent of the Plans and Specifications, but such supervision does not cover the duties of a clerk of the works. In case there is no clerk of the works provided by the Owner, Contractors must refer any questions about which there can be any doubt to the Architect for decision before proceeding to execute the work.

SPECIFICATIONS.

Section 1. Specifications must be prepared in ink or by some permanent process, and shall clearly explain the kind and quality of materials and methods of construction, and give such further information as may be needed to definitely supplement the Drawings.

Sec. 2. Everything that will be required in the work must be mentioned in the Specifications, as far as practicable, being classified and grouped under appropriate headings, and work called for by the Plans and not referred to in the Specifications, and vice versa, shall be included same as if mentioned by both Plans and Specifications, provided such work comes clearly within the branch or branches covered by the contract.

RULES FOR LETTING CONTRACTS.

Section 1. Written invitations for proposals will be forwarded Contractors for work to be let, stating when bids will be opened. This does not apply to public work requiring advertisement for proposals.

Sec. 2. Contractors desiring place upon the roster of an Architect's office shall furnish references as to *mechanical ability and fidelity* and be prepared to furnish a good and sufficient bond.

Sec. 3. Proposals shall be presented on the day set for opening of same, and will be opened in the presence of a representative of the bidders.

Proposals shall be opened, read and posted at the time specified before such bidders as are present. Contracts shall be awarded by Owners or Architects within a reasonable time thereafter.

Bidders shall not be held on proposals retained longer than ten days after date of opening.

Sec. 4. The lowest bidder will not be permitted to change the amount of his bid, but must sign contract or withdraw. The right is reserved to reject any or all proposals.

Sec. 5. If, after the opening of bids, changes are made in the Plans and Specifications amounting to not more than 10 per cent., the lowest invited bidder

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shall tender a detailed proposition for said changes, subject to the approval of the Architect and owner, and if found fairly detailed, the contract shall be awarded to him upon his bid so changed.

Sec. 6. Lack of ability to carry out the work in a proper manner, want of fidelity or disposition to render less than is due the Owner in strict conformity with the terms of contract, shall lay the Contractor liable to be dropped from the roster of the Architect, temporarily or permanently, as in the judgment of the Architect is just and right, and in the interests of his clients.

Sec. 7. Final certificates of payment on a contract shall not be issued by the Architect until the Contractor has returned all Plans and Specifications to the office of the Architect.

Adopted September 9, 1897.

H. B. WHEELLOCK, President.

C. R. ADAMS, Secretary.

Schedule of Charges for Professional Services, Recommended by the Association.

For full professional services (including supervision) 5 per cent. upon the cost of the work, except as below stated.

For partial services in case of abandonment or suspension of the work, the charge is as follows: Preliminary studies, 1 per cent. General drawing and Specifications, 2½ per cent. Details, 1 per cent.

EXCEPTIONS TO ABOVE RATES AS BELOW.

Dwellings costing less than \$10,000.....	7 per cent.
Dwellings costing more than \$10,000.....	6 per cent.
In no case shall the fee for any dwelling be less than \$150.	
Hospitals	8 per cent.
Factories	4 per cent.
Warehouses	4 per cent.
Additions and alterations to dwellings.....	10 per cent.
If less than \$1,000.....	12 per cent.
Additions and alterations to business buildings.....	7 per cent.
Alterations to store fronts and store fittings.....	10 per cent.
Designs for furniture.....	15 per cent.
Designs for inside finish.....	10 per cent.
Monumental and wrought metal work.....	15 per cent.

An additional charge will be made for additions and alterations in plans and contracts in proportion to time expended.

Necessary traveling expenses to be paid by the owner.

The Architect's payments are successively due as the work is completed.

Until an actual estimate is received, the charges are based on the proposed cost of the works, and the payments are received as installments of the entire fee.

The Architect bases his professional charge upon the entire cost to the owner of the building, when completed, including all fixtures necessary to render it fit for occupancy, and all old materials used are to be reckoned in cost as if new.

An Architect's duties comprise:

The furnishing of all necessary drawings, specifications and instructions; the general supervision of work and the auditing of all accounts.

Drawings and specifications are the property of the Architect.

Where a special Superintendent or Clerk of Works is required, the expense is to be borne by the owner. He will remain at the works during its progress, and secure the proper fulfillment of the contract. He will be selected by the Architect, to whom he will report.

EXTRA SERVICES.

Consultation fees for professional advice are to be paid in proportion to the importance of the questions involved at the discretion of the Architect, and none of the charges above enumerated cover professional or legal services connected with negotiations for site, disputed party walls, right of light, measurement of work or services incidental to arrangements consequent upon the failure of contractors during the performance of the work.

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AN ACT

TO PROVIDE FOR THE LICENSING OF ARCHITECTS, AND REGULATING THE PRACTICE OF ARCHITECTURE AS A PROFESSION.

Enacted by the Fortieth General Assembly, at the Regular Biennial Session, and
Approved June 3, 1897.

Section 1. Appointment of a State Board of Examiners of Architects.— *Be it enacted by the People of the State of Illinois, represented in General Assembly,* That within thirty days after the passage of this act the Governor of this State shall, by the advice and consent of the Senate, appoint a State Board of Examiners of Architects, to be composed of five members, one of whom shall be a member of the faculty of the Illinois State University, and the other four shall be architects residing in the State of Illinois, who have been engaged in the practice of architecture at least ten years. Two of the said practicing architects appointed as examiners shall be designated to hold office for two years from the date of the passage of this act, and the other two, together with the member of the faculty aforesaid, shall hold office for four years from the passage of this act; and thereafter, upon the expiration of the term of office of the person so appointed, the Governor of the State shall appoint a successor to each person whose term of office shall expire, to hold office for four years, and said person so appointed shall have the above specified qualifications. In case appointment of a successor is not made before the expiration of the term of any member, such member shall hold office until a successor is appointed and duly qualified. Any vacancy occurring in membership of the board shall be filled by the Governor of the State for the unexpired term of such membership.

Sec. 2. Examiners to file Oath of Office with the Secretary of State — Treasurer to file Bond—Salary of Secretary and Members of Board of Examiners.—The members of the State Board of Examiners of Architects shall, before entering upon the discharge of their duties, make and file with the Secretary of State the constitutional oath of office. They shall, as soon as organized, and annually thereafter, in the month of January, elect from their number a president and a secretary, who shall also be a treasurer. The treasurer shall file a bond for the penal sum of \$5,000, with the Secretary of State, to be accepted by the Governor of the State, before entering upon his duties. The board shall adopt rules and regulations to govern its proceedings, not inconsistent with this act, and a seal, and the secretary shall have the care and custody thereof, and shall keep a record of all the proceedings of the board, which shall be open at all times to public scrutiny. The secretary of the board shall receive a salary which shall be fixed by the board, and which shall not exceed the sum of fifteen hundred dollars (\$1,500) per year; he shall also receive his traveling and other expenses incurred in the performance of his official duties. The other members of the board shall receive the sum of ten dollars (\$10) for each day actually engaged in this service, and all legitimate and necessary expenses incurred in attending the meetings of said board; said expense shall be paid from the fees received by the board under the provisions of this act, and no part of the salary or other expenses of the board shall be paid out of the State treasury. All moneys received in excess of the said per diem allowance and other expenses provided for, shall be held by the treasurer as a special fund for meeting the expenses of said board, and the cost of an annual report of the proceedings of the State Board of Examiners of Architects.

Provided, however, that when the money in the hands of the treasurer at the time the

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annual report is rendered exceeds twenty-five hundred dollars (\$2,500), the amount of such excess shall be paid into the State treasury, to the credit of the State Board of Examiners of Architects.

Sec. 3. Quorum—Meetings of Board—Rules and Regulations.—Three members of the board shall constitute a quorum. Special meetings of the board shall be called by the secretary upon the written request of any two members, by giving at least seven days' written notice of the meeting to each member, reckoning from the day on which the notices are postmarked, telegraphed or personally delivered. The board shall adopt rules and regulations for the examination of applicants for licenses to practice architecture, in accordance with the provisions of this act, and may amend, modify and repeal such rules and regulations from time to time. The board shall, immediately upon the election of each officer thereof, and upon the adoption, repeal or modification of its rules of government or its rules and regulations for examinations of applicants for licenses, file with the Secretary of State, and publish in at least one architectural journal and one daily newspaper published in the State of Illinois, at least twice, the name and address of each officer, and a copy of such rules and regulations, or the amendment, repeal or modification thereof.

Sec. 4. Examinations—Applicants for License to Pay a License Fee of \$15—License Fee, \$25.—Provision shall be made by the board hereby constituted for holding examinations, at least twice in each year, of applicants for license to practice architecture, and any person over twenty-one years of age, upon payment of a fee of fifteen dollars (\$15) to the secretary of the board, shall be entitled to an examination for determining his or her qualifications. All examinations shall be made directly by said board, or a committee of two members delegated by the board, and due notice of the time and place of holding of such examinations shall be published, as in the case provided for the publication of the rules and regulations thereof. The examination shall have special reference to the construction of buildings, and a test of the knowledge of the candidate of the strength of materials, and of his or her ability to make practical application of such knowledge in the ordinary professional work of an architect, and in the duties of a supervisor of mechanical work on buildings, and should also seek to determine his or her knowledge of the laws of sanitation as applied to buildings. If the result of the examination of any applicant shall be satisfactory to a majority of the board, under its rules, the secretary shall, upon an order of the board, issue to the applicant a certificate to that effect, and upon payment to the secretary of the board by the candidate of a fee of twenty-five dollars (\$25), he shall thereupon issue to the person therein named a license to practice architecture in the State, in accordance with the provisions of this act, which license shall contain the full name, birth-place and age of the applicant, and be signed by the president and secretary, and sealed with the seal of the board. If an applicant fails to pass said examination his or her fee shall be returned.

All papers received by the secretary in relation to applications for license shall be kept on file in his office, and a proper index and record thereof shall be kept by him.

Sec. 5. Architects Who are Entitled to License Without an Examination.—Any person who shall, by affidavit, show to the satisfaction of the State Board of Examiners of Architects that he or she was engaged in the practice of the profession of architecture on the date of the passage of this act, shall be entitled to a license without examination, provided such application shall be made within six months after the passage of this act. Such license, when granted, shall set forth the fact that the person to whom the same was issued was practicing architecture in this State at the time of the passage of this act, and is, therefore, entitled to a license to practice architecture without an examination by the Board of Examiners, and the secretary of the board shall, upon the payment to him of a fee of twenty-five dollars (\$25), issue to the person named in said affidavit a license to practice architecture in this State, in accordance with the provisions of this act. In the case of a copartnership of architects, each member whose name appears must be licensed to practice architecture. No stock company or corporation shall be licensed to practice architecture, but the same may employ licensed architects. Each

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licensed architect shall have his or her license recorded in the office of the county clerk in each and every county in this State, in which the holder thereof shall practice, and he or she shall pay to the clerk the same fee that is charged for the recording of notarial commissions. A failure to have his or her license so recorded shall be deemed sufficient cause for revocation of such license.

Sec. 6. County Clerks to Keep Record of Licenses Recorded.—Each county clerk shall keep in a book, provided for the purpose, a complete list of all the licenses recorded by him under the provisions of this act, together with the date of the issuance of each license.

Sec. 7. Licensed Architects to Have a Seal.—Every licensed architect shall have a seal, the impression of which must contain the name of the architect, his or her place of business, and the words "Licensed Architect," "State of Illinois," with which he shall stamp all drawings and specifications issued from his office for use in this State.

Sec. 8. Penalty for Practicing Architecture Without License.—After six months from the passage of this act it shall be unlawful, and it shall be a misdemeanor punishable by a fine of not less than fifty dollars (\$50) nor more than five hundred dollars (\$500) for each and every week during which said offense shall continue, for any person to practice architecture without a license in this State, or to advertise, or put out any sign or card or other device which might indicate to the public that he or she is entitled to practice as an architect.

Sec. 9. Persons Who Are to be Regarded as Architects.—Any person who shall be engaged in the planning or supervision of the erection, enlargement or alteration of buildings for others, and to be constructed by other persons than himself, shall be regarded as an architect within the provisions of this act, and shall be held to comply with the same; but nothing contained in this act shall prevent the draftsmen, students, clerks of works or superintendents, and other employes of those lawfully practicing as architects, under license as herein provided for, from acting under the instruction, control or supervision of their employers; or shall prevent the employment of superintendents of buildings paid by the owners from acting, if under the control and direction of a licensed architect who has prepared the drawing and specifications for the building. The term building in this act shall be understood to be a structure, consisting of foundations, walls and roof, with or without the other parts; but nothing contained in this act shall be construed to prevent any person, mechanic or builder from making plans and specifications for, or supervising the erection, enlargement or alteration of any building that is to be constructed by himself or employes, nor shall a civil engineer be considered as an architect unless he plans, designs or supervises the erection of buildings, in which case he shall be subject to all the provisions of this act, and be considered as an architect.

Sec. 10. License Revoked.—Architects' licenses issued in accordance with the provisions of this act shall remain in full force until revoked for cause, as hereinafter provided. Any license so granted may be revoked by unanimous vote of the State Board of Examiners of Architects for gross incompetency, or recklessness in the construction of buildings, or for dishonest practices on the part of the holder thereof, but before any license shall be revoked such holder shall be entitled to at least twenty days' notice of the charge against him, and of the time and place of the meeting of the board for the hearing and determining of such charge. And on the cancellation of such license it shall be the duty of the secretary of the board to give notice of such cancellation to the county clerk of each county in the State in which the license has been recorded, whereupon the clerks of the counties shall mark the license recorded in his office canceled. After the expiration of six months from the revocation of a license, the person whose license was revoked may have a new license issued to him by the secretary upon certificate of the Board of Examiners, issued by them upon satisfactory evidence of proper reasons for his reinstatement, and, upon payment to the secretary of the fee of five dollars (\$5).

For the purpose of carrying out the provisions of this act relating to the revocation of licenses, the board shall have the power of a court of record, sitting in the county in which their meeting shall be held, and the power to issue subpoenas and compel the at-

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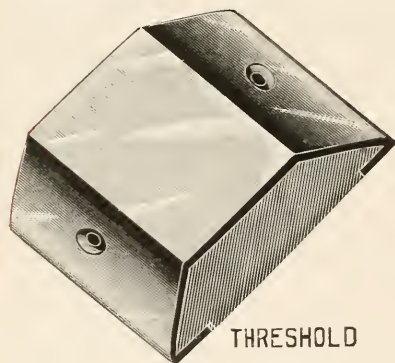
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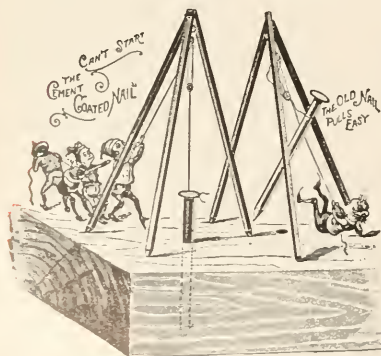
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tendance and testimony of witnesses. Witnesses shall be entitled to the same fees as witnesses in a court of record, to be paid in like manner. The accused shall be entitled to the subpoena of the board for his witnesses, and to be heard in person or by counsel in open public trial.

Sec. 11. Renewal of License.—Every licensed architect in this State who desires to continue the practice of his or her profession shall annually, during the time he or she shall continue in such practice, pay to the secretary of the board during the month of July a fee of five dollars (\$5), and the secretary shall thereupon issue to such licensed architect a certificate of renewal of his or her license for a term of one year. Any licensed architect who shall fail to have his or her license renewed during the month of July in each and every year shall have his or her license revoked at the discretion of the board. But the failure to renew said license shall not deprive him or her of the right to renewal upon payment of said fee.

Sec. 12. Report of Proceedings to be Filed with the Auditor of Public Accounts.—Within the first week of December, after the organization of the board, and annually thereafter, the secretary of the board shall file with the Auditor of the State a full report of the proceedings of the board, and a complete statement of the receipts and expenditures of the board, attested by the affidavits of the president and secretary, subject to the approval of the State Auditor.

Sections 2 and 11 were amended by the 41st General Assembly, at the regular biennial session, and approved.

Section 1. Be it enacted by the People of the State of Illinois represented in the General Assembly: That an act entitled, "An act to provide for the licensing of architects, and regulating the practice of architecture as a profession," approved June 3, 1897, in force July 1, 1897, be and the same is hereby amended by amending Sections 2 and 11 so that the same may read, when so amended, as follows:

Sec. 2. The members of the State Board of Examiners of Architects shall, before entering upon the discharge of their duties, make and file with the Secretary of State the constitutional oath of office. They shall, as soon as organized and annually thereafter, in the month of January, elect from their number a president and secretary, who shall also be the treasurer. The treasurer, before entering upon his duties, shall file a bond with the Secretary of State for such sum as shall be required of him by said Secretary of State, and in such form and with such securities as may be approved by the Governor of the State. The board shall adopt rules and regulations not inconsistent with this act to govern its proceedings; and also a seal, and the secretary shall have the care and custody thereof; and he shall keep a record of all the proceedings of the board, which shall be open at all times to public scrutiny; and the board shall cause the prosecution of all persons violating any of the provisions of this act, and may incur necessary expenses in that behalf.

The secretary of the board shall receive a salary which shall be fixed by the board, and which shall not exceed the sum of fifteen hundred (1,500) dollars per year; he shall also receive his traveling and other expenses incurred in the performance of his official duties. The other members of the board shall receive the sum of ten (10) dollars for each day actually engaged in this service, and all legitimate and necessary expenses incurred in attending the meetings of said board. Said expenses shall be paid from the fees received by the board under the provisions of this act, and no part of the salary or other expenses of the board shall be paid out of the State treasury. All moneys received in excess of the said per diem allowance and other expenses provided for, shall be held by the treasurer as a special fund for meeting the expenses of said board, and the cost of an annual report of the proceedings of the State Board of Examiners of Architects. And any moneys that may have been heretofore paid into the State treasury to the credit of said board are hereby appropriated to the said board, to be held by it as a part of said special fund; and the Auditor of Public Accounts is hereby authorized to issue a warrant for their re-payment on the requisition of said board and the approval of the Governor, in such amounts as may from time to time be required.

Sec. 11. Every licensed architect in this State who desires to continue the practice of his profession shall, annually, during the time he shall continue in such practice, pay to the secretary of the board during the month of July a fee of five (5) dollars, and the secretary shall thereupon issue to such licensed architect a certificate of renewal of his license for the term of one year. Any licensed architect who shall fail to have his license renewed during the month of July in each and every year shall have his license revoked; and it shall be the duty of the secretary of the board to give notice of such revocation to the county clerk in each county in the State, whereupon the clerks of the counties shall make an entry of such revocation accordingly.

But the failure to renew said license in apt time shall not deprive such architect of the right of renewal thereafter; and the secretary of the board shall give like notice of such renewal; but the fee to be paid upon the renewal of license after the month of July shall be ten (10) dollars, to cover the additional expense incurred by the board on account of such notices.

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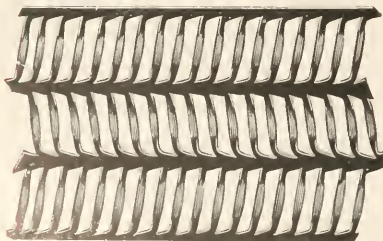
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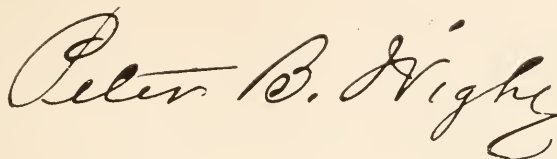
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Members of the Profession who will be Permitted to Practice in the State of Illinois.

This is to certify that I have examined the proofs of the list of Licensed Architects in the State of Illinois, made by the publishers of THE HANDBOOK FOR ARCHITECTS AND BUILDERS, and find that it agrees with the official list of Licensed Architects in this office.



Secretary of the State Board of Examiners of Architects.

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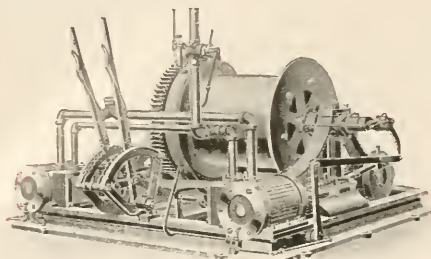
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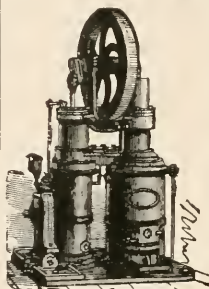
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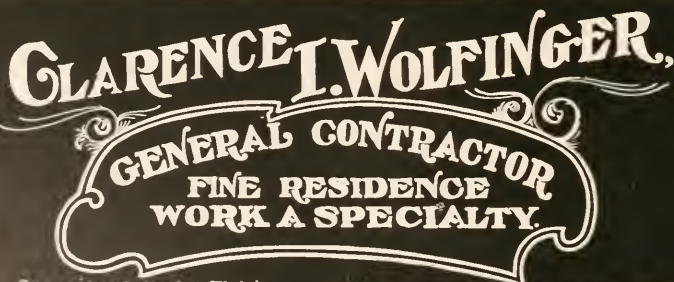
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*Holabird, Wm.....	1618 Monadnock bldg	1890
Hoskins, John M.....	1280 W. Madison st.	1891
*Huber, J. H.....	710, 171 Washington st.	1890
Huehl, H. W.....	59 Metropolitan bldg.	1898
*Jenney, W. L. B.....	520, 171 La Salle st.	1890
Krause, Edmund R.....	1601, 100 Washington st.	1895
Morehouse, M. J.....	702 Fisher bldg.	1902

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*Palmer, C. M.....	1207 Monadnock bldg.	1890
*Patton, N. S.....	1411 140 Dearborn st.	1890
Peabody, Arthur.....	1007 Monadnock bldg.	1902
*Perkins, Frederick W.....	1712, 204 Dearborn st.	1891
Pond, A. B.....	1109 Steinway Hall.	1902
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Renwick, E. A.....	Monadnock bldg.	1904
*Roche, M.....	1618 Monadnock bldg.	1890
Schmid, Richard G.....	59 Metropolitan bldg.	1898
Shaw, Howard Van Doren.....	175 Dearborn st.	1903
Stanhope, L. E.....	City Hall.	1904
*Strippelman, W.....	927, 153 La Salle st.	1890
*Townsend, F. B.....	706, 218 La Salle st.	1890
*Treat, S. A.....	1507, 279 Dearborn st.	1890
Van Keuren, Wm. J.....	78 La Salle st.	1901
Van Osdel, J. M.....	739, 225 Dearborn st.	1890
Waterman, H. H.....	925, 218 La Salle st.	1901
Wheelock, Harry B.....	1106 Schiller bldg.	1894
*Whitehouse, F. M.....	1 Madison ave., New York City.....	1894
Whittlesey, C. F.....	90 La Salle st.	1901
*Wight, Peter B.....	1112 Chamber of Commerce.	1893
Woltersdorf, Arthur F.....	70 La Salle st.	1902
*Zimmerman, W. Carby.....	1101 Steinway Hall.	1894

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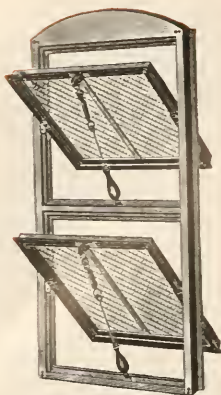
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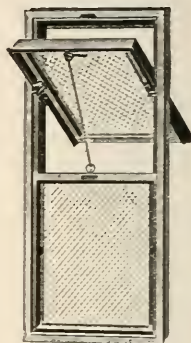
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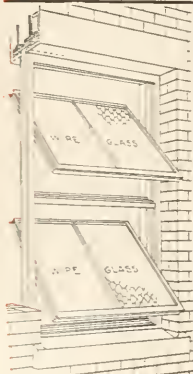
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 Struble, Henry, 293 E. 40th St.
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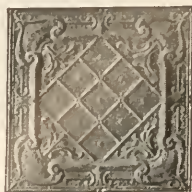
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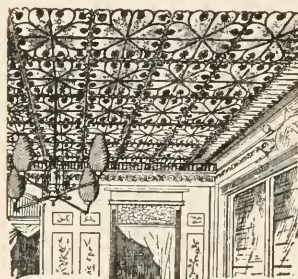
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JOHN O'NEILL.....	Track Elevation Expert.
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WM. QUINN (in charge).....	Bureau of Sewers.
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JOSEPH W. ERRANT.....	
CHRIS MIER.....	
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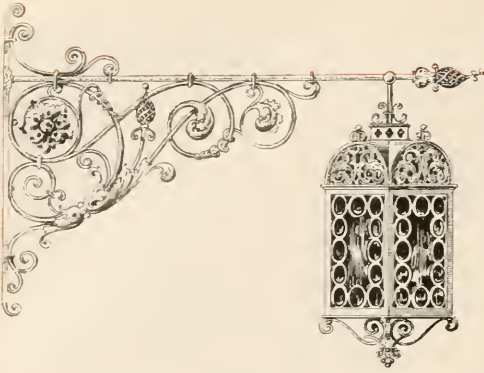
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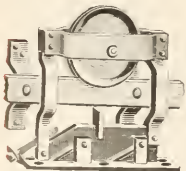
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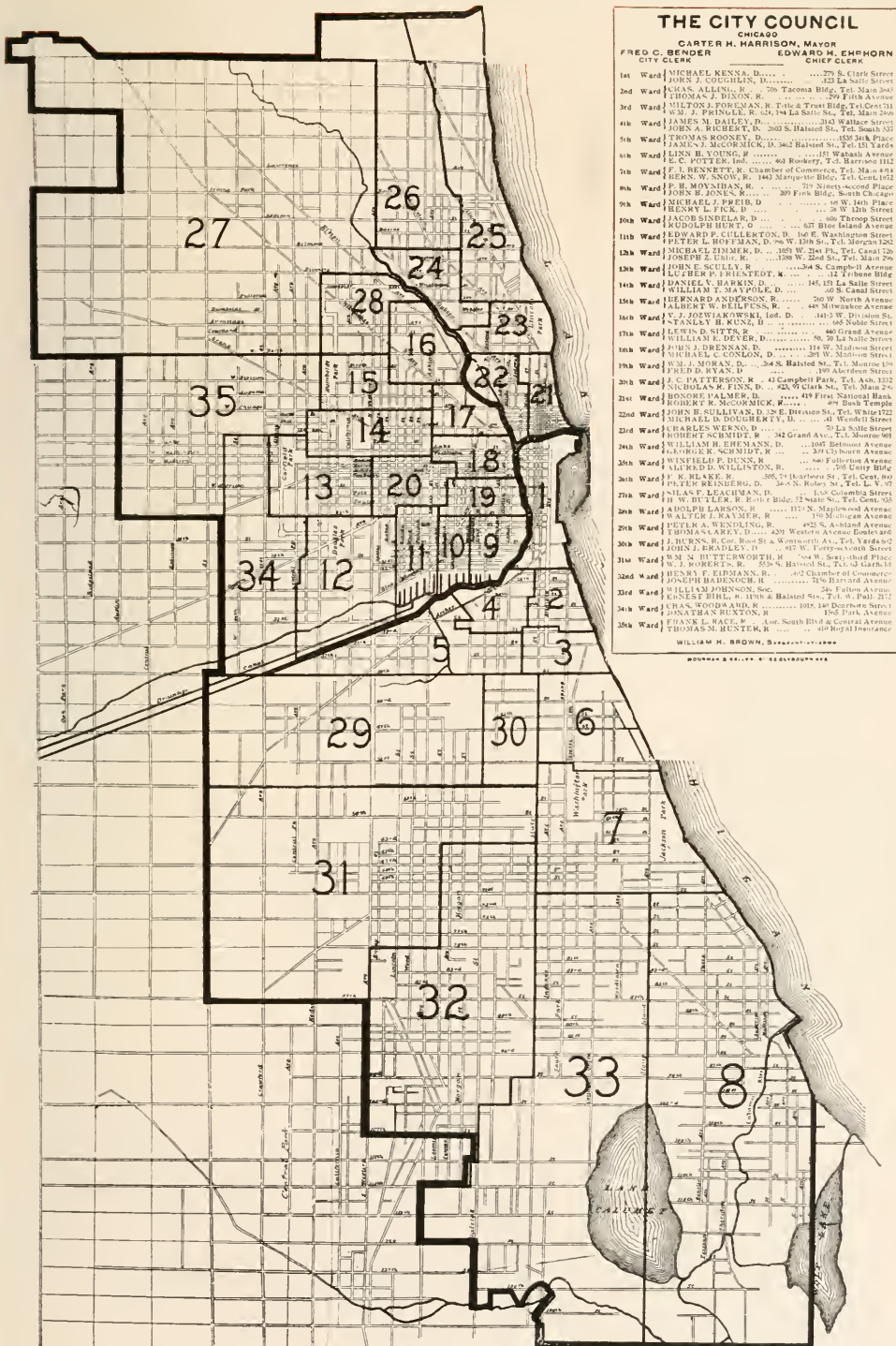
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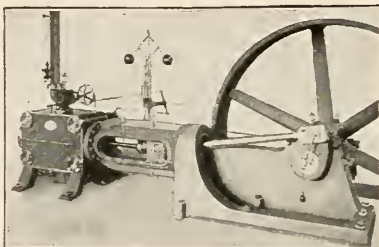
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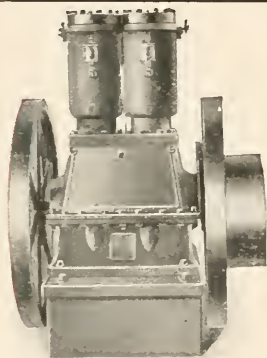
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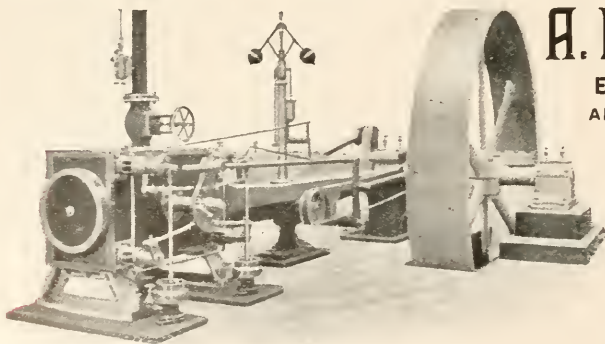
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BUILDING ORDINANCE.

The letters **T. H. O.** on Sections of this Ordinance refer to Sections in the Tenement House Ordinance, see page 109.

An Ordinance relating to the Department of Buildings and Governing the Erection of Buildings, Etc., in the City of Chicago, Passed March 28, 1898, and all Subsequent Amendments Thereto, as in Force and Effect on July 1, 1904.

The sections of the Building Ordinance of 1898, numbered from 164 to 197, inclusive, were repealed January 18, 1904, and the new Ordinance governing theatres, under Class 4 and 5, were passed in their stead. These new ordinances will be found on page 121.

On June 29, 1903, a special ordinance was passed by the City Council relating to the appointment of officers of the Department of Buildings of the City.

The sections relating to the same are abridged in Sections 1 to 28 inclusive.

Be it ordained by the City Council of the City of Chicago:

Section 1. Building Department Established.—There is hereby established an executive department of the municipal government of the City of Chicago, which shall be known as the Department of Buildings, and shall embrace a Commissioner of Buildings, a Deputy Commissioner of Buildings, an Assistant Deputy Commissioner of Buildings, a Secretary to the Commissioner, a Chief Building Inspector, also such inspectors of elevators, inspectors of stand pipes and fire escapes, and inspectors of buildings, and such other assistants and employes as the City Council may, by ordinance, prescribe and establish.

Sec. 2. Commissioner of Buildings—Qualifications—Appointment—Term—Person nominated to file affidavits as to Qualifications.—Ten (10) years' experience in Chicago as Architect, Civil Engineer or Builder. Appointed by the Mayor with consent of Council for a term of two (2) years.

Sec. 3. Commissioner's Bond.—Shall execute bond for twenty-five thousand (\$25,000) dollars.

Sec. 4. Appointment of Subordinates—Bonds of Subordinates.—Shall have management of Department and appoint, by consent of Mayor, all subordinate officers, and may remove same. Subordinates shall give approved bonds.

Sec. 5. Enforcement of Ordinances—Commissioner to Construe Ordinances—Copies of Constructions of Ordinances to be Furnished to Inspectors.

Sec. 6. Must Take Precautions in Behalf of Public Safety—May Require Repair or Alterations in Such Cases.

Sec. 7. Inspection of all Buildings in General Use—Must Report all Unsafe Conditions.—The Commissioner of Buildings shall inspect or cause to be inspected all public school buildings, public halls, churches, theaters and all buildings used either for manufacturing or commercial purposes, also hotels, apartment houses and other buildings, occupied by large numbers of people, for the purpose of determining the safety of such buildings, or any parts or appliances or equipment thereof, the sufficiency of their doors, passageways, aisles and stairways, and generally their facilities for egress in case of fire or other accident; the strength of their floors, their safeguards connected with the storage of combustibles, their appliances for extinguishing fires and for resisting the spread of fire, and shall make returns of all violations of the several provisions of this ordinance to the Law Department for prosecution.

Sec. 8. Must Keep Record of Private Property Taken for Public Use—Issue of Permits for such Property Guarded Against.

Sec. 9. Commissioner to Interpret this Ordinance.

Sec. 10. Commissioner to Make Inspection of Elevators—Power to Stop Use of Same.

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Sec. 11. Commissioner May Order Precautions Taken in Unsafe Buildings—May Direct Fire Department to Remove Same.

Sec. 12. May Make Rules for Construction of Buildings.

Sec. 13. May Stop Construction when in Violation of Ordinance—Must Sign All Certificates and Notices.

Sec. 14. Commissioner Must Keep a Register of All Transactions.

Sec. 15. Must Keep Account of Fees Paid.

Sec. 16. Must Render Report Monthly.

Sec. 17. Must make Annual Report to City Council with Estimates.

Sec. 18. Salary of Commissioner.—Shall be five thousand (\$5,000) dollars per year.

Sec. 19. Office of Deputy Building Commissioner Created—Qualifications—Duties.—Shall Record Violations of Ordinances—Bond —Qualifications same as for Commissioner of Buildings. Civil Service Examination.

Examination.—He shall pass upon all questions relating to the strength and durability of buildings, shall examine and approve all plans before a building permit is issued for the construction of any building or erection, shall supervise and have charge of all books and records and the various inspectors employed in the Department of Buildings; shall receive, examine and file all reports made by them, and shall under the direction and supervision of the Commissioner of Buildings assign to said inspectors the work they are to perform. He shall have a book or books in which shall be recorded the location and character of every building for which a permit is issued and a copy of every report of inspection made for such building, so arranged that the full history of the various inspections of the buildings shall appear therein in consecutive order with the name of each inspector making the inspection thereof and the date of his report. His bond shall be ten thousand (\$10,000) dollars.

Sec. 20. Salary of the Deputy Building Commissioner shall be four thousand (\$4,000) dollars.

Sec. 20a. Office of Assistant Deputy Building Commissioner Created—Qualifications—Shall Assist Deputy Building Commissioner.—Must be competent Engineer, Architect, or Builder with five (5) years' experience. Must pass Civil Service examination. Must execute bond for ten thousand (\$10,000) dollars.

Sec. 21. Office of Secretary Created—Duties of.—Appointed by Building Commissioner. Civil Service examination.

Sec. 21a. Office of Chief Building Inspector, Created—Qualifications—Duties—Bond—Salary.—Must be a competent Civil Engineer, Architect or Builder, of five (5) years' experience in Chicago. Must pass Civil Service examination. Bond to be ten thousand (\$10,000) dollars. Salary eighteen hundred (\$1,800) dollars.

Sec. 22. Inspectors—Qualifications—Examinations of.—Must be competent either as Architects, Civil Engineers, Bricklayers or Stonemasons, of five (5) years' experience. Civil Service examination.

Sec. 23. Inspectors—Their Duties—How Made.

Sec. 24. Inspectors Must File Daily Report.

Sec. 25. Record of Inspection—How Made.—The said inspectors shall examine all buildings and walls reported dangerous or damaged by fire or accident, and make a record of such examinations, with the name of the street and number of the building, and of the names of the owners, agents, lessees and occupants thereof.

Sec. 26. Inspection of Alteration, Enlargement or Raising.

Sec. 27. Other Duties.—Said inspectors shall perform such other duties as may be required of them.

Sec. 28. Elevator Inspectors—Qualifications—Examinations.—Inspectors shall be experienced mechanical engineers, builders or mechanics. Shall pass Civil Service examination and shall not be employed or engaged in any other business or vocation.

Sec. 29. Elevator Inspections—How Made—Record of.—They shall, as often as once in six months carefully examine and inspect each hoistway in which an elevator is used or operated, and the doors and shafts in connection therewith; and also examine and inspect all passenger and freight elevators, cars or platforms used and operated in any building in the City of Chicago, and report in writing to the Commissioner of Buildings the condition of each hoistway and elevator, and shall enter such reports in books kept for this purpose and open to official inspection.

Sec 29a. To improve the construction, operation, service and safety of passenger and freight elevators.

(1.) Permit for Construction.—Before proceeding with the construction of any passenger or freight elevator (except such as are hereinafter excepted from the provisions of this ordinance) there shall be obtained by the owner or agent of the building in which

such elevator is to be constructed, a permit for such construction from the Commissioner of Buildings; and it shall be unlawful for any such owner or agent to proceed with, permit or allow the construction of any such elevator within the corporate limits of the City of Chicago, unless such permit shall have been previously obtained from the Commissioner of Buildings; and any owner or agent of any building wherein any such elevator or elevators is or are being, or is or are about to be constructed, who causes, permits or allows such construction, or permits to be constructed any such elevator or elevators, or who permits or allows any attempt to construct any such elevator or elevators, without having previously obtained the permit hereinbefore provided, shall be fined in a sum of not less than fifty (\$50.00) dollars nor more than two hundred (\$200.00) dollars.

(2.) **Testing of Safety Devices and Fine for Interference.**—Every passenger or freight elevator hereinafter constructed (except such as are hereinafter excepted from the provisions of this ordinance) in any building within the corporate limits of the City of Chicago shall be provided with some efficient device to secure the safe operations of such passenger or freight elevator in its running up or down, and such device shall be subjected to such practical test as may be determined by the Commissioner of Buildings to ascertain the efficiency of such safety device to properly perform the service for which it is intended; and it shall be the duty of the Commissioner of Buildings to cause to be made such test of each and every device upon any such elevator hereafter constructed, and no such elevator hereafter constructed shall be permitted to run until inspection herein provided for has been made and a certificate issued from the Commissioner of Buildings or such inspector that the same has been inspected, which such certificate shall be posted in a conspicuous place in such elevator. Every passenger or freight elevator now in operation within the corporate limits of the City of Chicago, or which may be hereafter constructed and operated, shall be provided with some efficient device to procure the safe operation of such passenger or freight elevator in its running up and down, and such device shall be subjected to the same test herein provided for elevators to be hereafter constructed, and a certificate of such inspection issued as provided for elevators to be hereafter constructed, and every such elevator now in operation within the corporate limits of the City of Chicago, or which may hereafter be constructed and operated in the City of Chicago, shall be inspected under and by authority of the Commissioner of Buildings at least once every six (6) months. Every owner or agent of any building who fails to comply with any provision or provisions of this section of this ordinance shall be fined in a sum of not less than fifty (\$50.00) dollars nor more than two hundred (\$200.00) dollars; and every owner or agent of any building wherein any passenger or freight elevators are situated in the City of Chicago who refuses to permit the inspection of any such elevator or who refuses to permit the making of the test in this section of this ordinance provided, shall be fined in a sum of not less than twenty-five (\$25.00) dollars nor more than two hundred (\$200.00) dollars for each and every day which such elevator runs or is operated on and after the day and date of the refusal to permit inspection of such elevator or elevators or the refusal to allow such test to be made.

(3.) **Commissioner Must Test Safety Within Six (6) Months from Passage of the Ordinance.**—Every passenger or freight elevator now running or operating within the corporate limits of the City of Chicago, or which may hereafter be constructed and run and operated, shall be provided with some efficient device for the purpose of preventing the cab or car of such elevator from falling, or the securing of the safety of the cab or car and its load, in case it should fall, and all such devices that are applied to such passenger or freight elevator for the purpose of preventing such cab or car from falling or for stopping it in case it does fall, shall be subjected to a practical test to determine the efficiency of such device and to secure the safety of the cab or car and its contents. Every such passenger or freight elevator shall be provided with the device hereinbefore in this section of this ordinance set forth within six (6) months from and after the passage of this ordinance; and it shall be the duty of the Commissioner of Buildings to cause to be made the test hereinafter provided for within not less than nine (9) months from and after the passage of this ordinance, and every person, whether owner or agent, of any building wherein any such passenger or freight elevator within the corporate limits of the City of Chicago is now run or operated, or which may hereafter be constructed or operated, who shall fail or neglect to provide such passenger or freight elevator with such device for the purpose of preventing the cab or car from falling, or the securing of the safety of the cab or car in case it should fall, shall be fined in a sum of not less than twenty-five (\$25.00) dollars nor more than two hundred (\$200.00) dollars, for each and every day that such elevator is run or operated without being provided with such device.

(4.) **Liability of Owner in Refusing Tests.**—Any owner or agent of any building wherein any passenger or freight elevator is run or operated within the corporate limits of the City of Chicago, who desires to have a test made by and under the authority of the Commissioner of Buildings as to whether such elevator or elevators is provided with the device mentioned in Section 3 of this ordinance, shall or may notify said Commissioner of Buildings in writing that such a test is desired and the time when such test may be made, which shall be not less than two (2) nor more than ten (10) days after such

notice is given to the Commissioner of Buildings; and it shall be the duty of every owner or agent of any such building wherein any such passenger or freight elevator is run or operated in the City of Chicago, or which may hereafter be constructed and operated, to permit the making of the test of the device provided for in Section 3 of this ordinance upon demand being made by the Commissioner of Buildings or duly authorized Inspector, and every owner or agent of any such building wherein any such passenger or freight elevator is run or operated, or which may be hereafter constructed and operated, who refuses to permit the test of the device provided for in Section 3 of this ordinance, to be made upon demand of such Commissioner of Buildings or Elevator Inspector, within five (5) days from and after such demand is made, shall be fined not less than twenty-five (\$25.00) dollars nor more than two hundred (\$200.00) dollars for each and every day such passenger or freight elevator is run or operated after such demand for and refusal of the making of such test.

(5.) Certificate Furnished Certifying to the Tests.—Whenever the test of the device provided for in Section 3 of this ordinance has been made, it shall be the duty of the Commissioner of Buildings or Inspector of Elevators to cause to be issued a certificate of the making of such test, which certificate shall set forth whether or not such test is found sufficient and satisfactory, and each certificate shall be furnished to the owner or agent of the building wherein such elevator is operated, and shall be posted in a conspicuous place in said elevator.

(6.) Tests to be Made Semi-Annually.—It shall be the duty of the Commissioner of Buildings to cause the test to be made as provided for in section 3 of this ordinance of each passenger and freight elevator in the City of Chicago at least once in six (6) months from and after the making of the test or the issuance of the certificate therefor.

(7.) Duties of Inspectors.—Whenever any Inspector of any passenger or freight elevator finds any of the running parts or automatic devices out of order or in an unsafe condition he shall immediately report the same to the Commissioner of Buildings, together with a statement of all the facts relating to the condition of said elevator or elevators.

(8.) Power to Shut Down Elevators.—It shall be the duty of the Commissioner of Buildings, upon receiving report from any inspector of the unsafe condition of any elevator, to order said elevator to be stopped from use until the same may be placed in a safe condition, and any owner or agent of any building wherein any such passenger or freight elevator is run or operated, within the corporate limits of the City of Chicago, who permits or allows any such elevator to run after the receipt of the notice, in writing, from the Commissioner of Buildings that any such elevator is out of order, or is in an unsafe condition, shall be fined in a sum not less than twenty-five (\$25.00) dollars nor more than two hundred (\$200.00) dollars for each and every day such elevator is run or operated without being put in a safe condition or placed in good order.

(9.) Device That Will be Satisfactory.—Any device which shall prove efficient for the purposes hereinbefore described in this ordinance shall be approved by the Commissioner of Buildings, if, after a test by said Commissioner or any of his elevator inspectors, it is found that such device or devices satisfactorily perform the work it is intended should be performed by such device or devices in and by the provisions of this ordinance.

(10.) Does Not Repeal Former Ordinances.—The certificates and inspections herein provided for shall be made at the same time that the inspections provided for by Sections 29, 30 and 31 of an ordinance passed March 28, 1898, known as the "Building Ordinance," are made. The provisions of this ordinance shall not be so construed as to repeal, alter or change any of the provisions of Sections 28, 29, 30 and 31 of said "Building Ordinance" of March 28, 1898, and the fee required to be paid in and by said Section 30 of said "Building Ordinance" of March 28, 1898, shall include the cost of any inspection and the issuance of any certificate provided for in and by this ordinance, it being intended that this ordinance be construed as an addition to the provisions of the "Building Ordinance" of March 28, 1898, in so far as it relates to the inspection of elevators.

(11.) Elevators Exempt from Safety Devices.—The provisions of this ordinance shall not apply to any elevators in any private residence not more than three stories in height, elevators running between two floors only of any building, nor to any hand hoists, elevator or hoist used solely for hoisting materials, tools or workmen in any building in course of construction.

Passed Nov. 13, 1899.

Sec. 30. Inspector—Fees.—The owners, agents or occupants of all buildings in which elevators are used shall pay the Commissioner of Buildings, before a certificate of inspection is issued to him, a fee of two (\$2) dollars for each inspection of each elevator made in pursuance of this ordinance.

Sec. 31. Certificates of Inspection—Details of.—When an inspector finds a hoistway, door, shaft and elevator in a perfectly safe condition, he shall make and deliver to the

owner, or to his or her agents, a certificate signed by the Commissioner, which shall contain the date of inspection, the condition of the elevator at that date, the weight it may safely carry, and that the shaft and doors are constructed in a safe and proper manner, or are constructed in accordance with this ordinance, which certificate shall be by the owner of the elevator framed and put up in some conspicuous place in such elevator, for examination by the public; *provided*, that the words "safe condition" in this section shall mean that it is safe for any load up to its original safe capacity.

Sec. 32. Other Duties.—The Inspector of Elevators shall perform such other duties as may be required of him by the Commissioner of Buildings, the rules and regulations of the Department of Buildings, or the ordinances of the city.

Sec. 33. Entrance to Buildings.—The Commissioner and Deputy Commissioner of Buildings, as well as the Inspectors of Buildings and of Elevators, are empowered to enter any building, whether completed or in process of erection, for the purpose of determining whether the same has been or is being constructed in accordance with the terms of this ordinance, and it shall not be lawful to exclude them from such building.

Sec. 34. Appeal from Decision.—Arbitration.—Limit of Time of Appeal.—Cost of Appeal.—Arbitrators to Take Oath.—Power to Examine Witnesses.—In Urgent Cases Commissioner's Power Final.—Emergency Board of Arbitration. In cases where discretionary power to estimate damage to frame buildings is given the Commissioner of Buildings, as also in questions relating to the security or insecurity of buildings or parts thereof, and in all other cases where discretionary powers are, by these ordinances, given to the Commissioner of Buildings, an appeal to arbitration shall be allowed to parties believing themselves injured or wronged, by the decisions of the Commissioner of Buildings, as follows, to-wit:

The persons wishing to make such appeal shall do so within five days after written notice of the decision or order of the Commissioner of Buildings has been given them. An appeal made later than five days after serving notice of the Commissioner of Buildings shall not entitle the appellant to an arbitration. The request for arbitration shall be in writing, and shall state the object of the proposed arbitration and the name of the person who is to represent the appellant as arbitrator. The Commissioner of Buildings shall thereupon state to the appellant the cost of such arbitration, and such appellant shall, within twenty-four hours from the time of filing the original request for arbitration, deposit with the Commissioner of Buildings the sum of money required for defraying the expenses of the same, which sum shall in each case be fixed by said Commissioner in proportion to the difficulty and importance of the case, but shall in no case be more than the cost of similar service in the course of ordinary business of private individuals or corporations. As soon as such sum of money shall have been deposited with him, the Commissioner of Buildings shall appoint an arbitrator to represent the city, and the two arbitrators thus appointed shall, if they cannot agree, select a third arbitrator, and these arbitrators shall, after investigating the matter in question, make a decision with regard to the same, which shall be final and binding upon the appellant as well as upon the city. The arbitrators shall themselves, before entering upon the discharge of their duties, be placed under oath to the effect that they are unprejudiced as to the matter in question, and that they will faithfully discharge the duties of their position. They shall have the power to call witnesses and place them under oath, and their decision or award shall be rendered in writing both to the Commissioner of Buildings and to the appellant from his decision. The fee deposited by the appellant with the Commissioner of Buildings shall be paid by the Commissioner of Buildings to the arbitrators upon the rendering of their report, and shall be in full of all costs incident to the arbitration; but should the decision of said Board of Arbitration be rendered against the Commissioner of Buildings, then the money deposited by the aforesaid appellant shall be returned to him, and the entire costs of said arbitration shall be paid by the City of Chicago.

Whenever the Decision of the Commissioner of Buildings upon the safety of any building or any part thereof is made in a case so urgent that failure to promptly carry out his orders to demolish or strengthen such building or part thereof may endanger life and limb, the decision and order of the Commissioner of Buildings shall be absolute and final.

Provided, If in the opinion of the Commissioner of Buildings it becomes necessary to demolish any building, or part thereof, said Commissioner of Buildings shall call to his aid the President of the Illinois Chapter of the American Institute of Architects and the President of the Builders' and Traders' Exchange of Chicago, or their appointees, who, with the Commissioner of Buildings, shall form a Board of Arbitration, and the decision of a majority of said Board shall be absolute and final. Said Board of Arbitration shall serve without pay, and must report within forty-eight hours after their appointment; but it is expressly understood that said Board of Arbitration shall not have any authority or power in cases of walls or buildings destroyed by fire, explosion or similar causes, and that the decision of the Commissioner of Buildings in such cases shall be absolute and final.

Sec. 35. Permits—When Required.—Limitation of Time for Permits.—Before proceeding with the erection, enlargement, alteration, repair or removal of any building in

the City of Chicago, a permit for such erection, enlargement, alteration, repair or removal shall first be obtained by the owner or his agent from the Commissioner of Buildings, and it shall be unlawful to proceed with the erection, enlargement, alteration, repair or removal of buildings, or of any structural part thereof, or of any structure which is to be used for the support, shelter or enclosure of persons, animals or chattels within the City of Chicago, unless such permit shall first have been obtained from the Commissioner of Buildings.

If, after a permit for the erection, enlargement, alteration, repair or removal of a building shall have been granted, the operation called for by the said permit shall not be begun within six months of the date thereof, or if such operations are not completed within the time fixed in said permit for the duration thereof, then said permit shall be void, and before such operations can be begun or completed, a new permit shall be taken out by the owner or his agent, and fees as herein fixed for the original permit shall be paid therefor.

Sec. 36. Application for Permits—How Made—How Recorded.—Stamped Plans—How Cared for.—Return of Same.—Applications for such permits shall be made in writing by the owner or his agent, and when such application and plans and specifications conform to this ordinance, the Commissioner of Buildings shall issue a permit, and shall file said application, and shall apply to such plans and specifications an official stamp, stating that the drawings and specifications, to which the same have been applied, comply with the terms of this ordinance. The plans and specifications so stamped shall then be returned to such applicant. True copies of so much of said plans and specifications as may be required in the opinion of the Commissioner of Buildings to illustrate the features of construction and equipment of the building referred to in this ordinance shall be filed with the Commissioner of Buildings, and shall remain on file in his office until the completion or occupation of said building, after which such drawings and specifications shall be returned by the Commissioner of Buildings to the parties by whom they have been deposited with him, upon the demand of said person or persons. It shall not be obligatory upon the Commissioner of Buildings to retain such drawings in his custody for more than three months after the completion or occupation of any building.—T. H. O. Sec. 16.

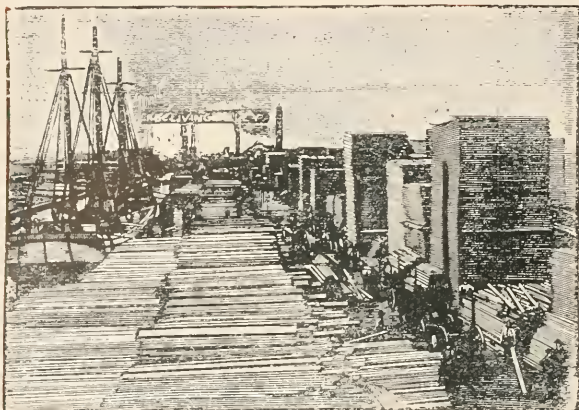
And all such plans and drawings shall be drawn to a scale of not less than one eighth ($\frac{1}{8}$) of an inch to the foot, on paper or cloth, in ink, or by some process that will not fade nor obliterate. All distances and dimensions must be accurately figured, and drawings made explicit and complete, showing the entire sewerage and drain pipes and location of all plumbing fixtures within such building. Each set of plans presented for permit must be accompanied by a set of specifications describing all materials to be used in the proposed building, and both the plans and specifications must be approved by the Commissioner of Buildings before a permit will be granted. No permit shall be granted or plans approved unless such plans shall be signed and sealed by a licensed architect, as provided in "An act to provide for the licensing of architects and regulating the practice of architecture as a profession in the State of Illinois," approved June 3d, 1897. Provided, that permits may be granted for the erection of buildings of Class III, as hereinafter defined, provided such buildings shall not be more than two stories in height and shall have a superficial area of not more than 1,250 square feet, outside dimensions, on plans approved by the Commissioner of Buildings, which plans need not be signed by a licensed architect; provided, that all architects and applicants for such permits shall obtain from the City of Chicago a license, as provided for in Section 219 of this ordinance.

Sec. 37. Alterations Upon Stamped Plans Not Permitted Without Permission.—It shall be unlawful to erase, alter or modify any lines, figures or coloring contained upon such drawings or specifications so stamped by the Commissioner of Buildings, or filed with him for reference. If, during the progress of the execution of such work, it is desired to deviate in any manner affecting the construction or other essential of the building from the terms of the application, drawing or specification, notice of such intention to alter or deviate shall be given in writing to the Commissioner of Buildings, and his written assent must first be obtained before such alteration or deviation may be made. Alterations in buildings which do not involve any change in their structural parts or of their stairways, elevators, fire escapes or other means of communication or ingress or egress may be made without the permission of the Commissioner of Buildings.—T. H. O. Sec 50.

Sec. 38. Deposit with Water Department—How Made—Indemnifying Bond.—Before the Commissioner of Buildings issues a permit as aforesaid, he shall first satisfy himself that the applicant for such permit has made payment to the Bureau of Water of the City of Chicago for the water to be used in such building, or for water meter for measuring all the water used in the construction of such building under the regulations of the Bureau of Water. He shall also, before issuing such permit, satisfy himself that the applicant for the same has filed with and approved by the Commissioner of Public Works of the city an indemnifying bond protecting the city as against any and all damage that may arise to the streets or alleys upon which such building

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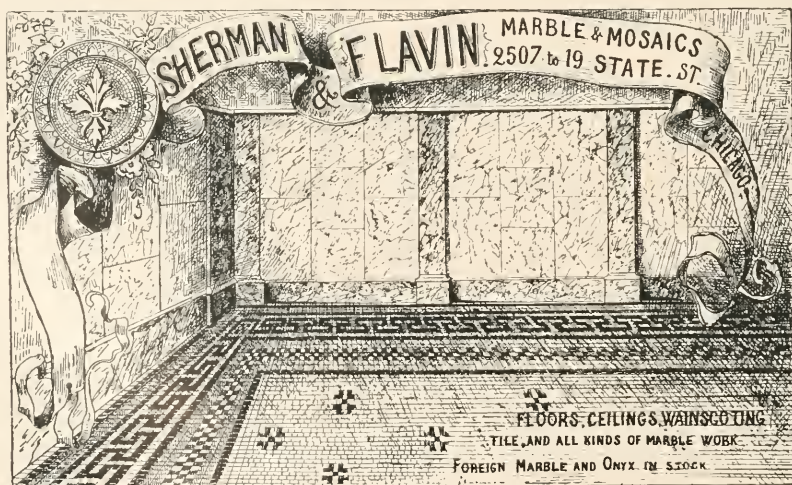
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is situated, and to the City of Chicago, and to life and limb of passers-by, in consequence of the proposed operations to be covered by said permit.

Sec. 39. Fees for Water Used.—Fees for Street Obstructions.—The fees to be paid in connection with permits for the erection of buildings, shall be as follows, to-wit:

For the water to be used in connection therewith at the rate of five cents for every 1,000 bricks, wall measure, used in the construction of a building; also,

At the rate of six cents for every 100 cubic feet of rubble stone used in connection therewith; also,

At the rate of eight cents for every 100 cubic feet of concrete used in connection therewith; also,

At the rate of fifteen cents for every 100 yards of plastering used in connection therewith; and,

At the rate of five cents for every 100 cubic feet for hollow tile arch, partition or fire-proof covering used in any building.

Permits for the obstruction of streets shall be issued by the Commissioner of Public Works and shall be paid for, in proportion to the street frontage occupied, at the rate of two dollars per month for each twenty-five feet of frontage so occupied.

Provided, that before any permit is issued by the Commissioner of Public Works to any person, firm or corporation engaged in the roofing business, for leave to use the public streets for delivery of material or as a temporary storage place for such roofing material, such person, firm or corporation shall file with the Commissioner of Public Works a bond to the City of Chicago in the sum of five thousand (\$5,000) dollars, to be approved by said Commissioner of Public Works, conditioned to save the City of Chicago harmless from all damages on account of such user, and shall also deposit for each job or building, if the Commissioner of Public Works shall so require, the sum of fifty (\$50) dollars with the said Commissioner of Public Works for the purpose of securing the immediate repair and clearing of any portion of the public streets encumbered by such material, and for this purpose not less than the sum of two (\$2) per month in advance, during the furnishing of such roofing material, shall be charged against said deposit for the use of the City of Chicago for the purpose aforesaid of clearing the public streets of such material as may be accidentally or otherwise scattered thereon during the furnishing of such roofing material in the case of each building or appurtenance upon which roofing is being done by such person, firm or corporation, and the balance of such deposit in each instance will be surrendered to such person, firm or corporation at any time upon the surrender of the permit for the use of the public streets for the particular job in which the permit was issued and the said deposit made and the surrender of the receipt therefor.

Sec. 40. Permits—Cost of.—The price for building permits proper shall be as follows: For sheds not exceeding 256 square feet in area, \$1.

For open shelter sheds at the rate of fifty cents for each 1,000 cubic feet or part thereof.

For buildings one story in height and not exceeding 25 by 40 feet in area, \$1.50.

For buildings more than one story in height or larger in area than 25 by 40 feet, the fee for the permit shall be at the rate of ten cents for every 1,000 cubic feet or fractional part thereof contained in said structure, the cubic contents being measured to include every part of the building from the basement floor to the highest point of roof, and all bay windows and other projections.

Sec. 41. Occupation of Sidewalk and Street—Limitations.—The extent of occupation of sidewalk and street to be covered by the terms of a permit for street obstruction or building, shall be as follows:

Such permit shall not authorize the occupation of any sidewalk or street or part thereof other than that immediately in front of the premises of the building upon which said permit is issued.

During the progress of building operations, at least one-third of the sidewalk in front of the premises of the building for which such permit is granted, shall be at all times kept free and unobstructed for the purposes of passage, and clear of rubbish, dirt and snow. Such sidewalks must, if there are excavations on either side of the same, be protected by substantial railings which shall be built and maintained thereon so long as such excavations continue to exist. It is not intended hereby to prohibit the maintenance of a driveway for the delivery of material across such sidewalk from the curb line to the building site.

Sec. 42. Delivery of Material—Elevated Sidewalks.—Temporary Roof Over Sidewalk—Time Maintained.—Storage of Building Materials.—Limitations—Excavated Material and Rubbish—How Cared for.—It shall be permitted, for the purpose of delivering material to the basements of the buildings, to elevate such temporary sidewalks to a height of not exceeding four feet above the curb level of the street; and in case a sidewalk is so elevated, it shall be provided with good substantial steps on both ends of the same, and shall have railings, as before specified, on both sides thereof.

If the building to be erected is more than four stories in height, and is set at or near the street line, there shall be built over such sidewalk a roof having a framework and covering, composed of supports and stringers of 3 by 12 timbers, not more than four feet from centers, covered by two layers of 2-inch plank.

Said roof shall be maintained as long as material is being used or handled on said street front and above the level of such sidewalk.

In all cases, such temporary sidewalks and their railings and approaches, and the roofs over the same, shall be made, as regards ease of approach, strength and safety, to the satisfaction of the Commissioner of Buildings.

The occupation of the street for the storage of building materials shall never exceed, in front of any one building, one-quarter of the width of the roadway of the same, and in streets containing railroad tracks, such occupation shall not exceed one-half the distance from the curb stone to such railroad track.

Earth taken from excavations, and rubbish taken from buildings, must not be stored either upon sidewalks or roadways of streets, and must be removed from day to day as rapidly as produced. When dry rubbish, apt to produce dust, is being handled, it must be kept wetted down, so as to prevent its being blown about by the wind.

Sec. 43. Derricks—Limitation.—For all buildings more than four stories in height the use of derricks set upon the sidewalk is prohibited. Materials for such buildings shall be hoisted entirely within the enclosing walls of the same. On no condition shall derrick posts be allowed put on the public street, and in no case shall the guy lines be less than 15 feet above the roadbed.

Sec. 44. Adjacent Frontage—How Occupied for Building Purposes.—It is provided that if the written consent and a waiver of claims for damages against the City of Chicago of the owners of properties abutting upon the site of any proposed building is first obtained and filed with the Commissioner of Public Works, the permission to occupy the roadway and the sidewalk may be extended beyond the limits of such building upon the same terms and conditions as those herein fixed for the occupation of sidewalk and street in front of the building sites themselves.

Sec. 45. Use of Street for Building Purposes—When Terminated.—The permission to occupy streets and sidewalks for the purposes of building is intended only for use in connection with the actual erection, repair, alteration or removal of buildings, and must terminate with the completion of such operation. It shall be unlawful to occupy any sidewalk or street after the completion of the operation for which a permit has been issued by the Department of Buildings. It shall also be unlawful to occupy a sidewalk or street, under authority of such permit, for the storage of articles not intended for immediate use in connection with the operations for which such permit has been issued.

Sec. 46. Red Lights.—Red lanterns shall be displayed and maintained during the whole of every night at each end of every pile of material in any street or alley and at each end of every excavation.

Sec. 47. Hospitals—Stables—Special Consents Necessary.—Before granting permits for the construction or alteration or enlargement of hospitals or of livery, sale or boarding stables, the Commissioner of Buildings shall take notes of the following provisions of this ordinance relating to such buildings:

Sec. 48. Hospitals — Permits — Special Consents — Fire-Proof Construction.—It shall be unlawful for any person, firm, or corporation to build, construct, maintain, conduct or manage in any block in which two-thirds (2-3) of the buildings fronting on both sides of the street or streets on which the proposed hospital may front are devoted to exclusive residence purposes, any hospital for the care, treatment or nursing of three or more insane persons; or any hospital for the care, treatment or nursing of three or more inebriates, or persons suffering from the effects of the excessive use of alcoholic liquors; or any hospital for the care, treatment or nursing of three or more epileptics; or any hospital for the care, treatment or nursing of three or more persons addicted to, or suffering from, the excessive use of morphine, cocaine or other similar drugs or narcotics; or any hospital for the care, treatment or nursing of any person or persons affected with any contagious disease, unless the owners of a majority of the frontage in such block, and the owners of a majority of the frontage on the opposite side or sides of the street or streets on which said building faces, consent in writing to the building, constructing or maintaining, managing or conducting of any such hospital in said block. Such written consents of the majority of said property owners shall be filed with the Commissioner of Buildings, and an exact copy of same shall be filed with the Commissioner of Health before a permit shall be granted for the building or constructing, or a license issued for the maintaining, conducting or managing of any such hospital. Provided that any such building that may be used for such purposes as set forth in this section and which is over two stories in height shall be of fireproof construction throughout.

As amended June 8, 1903.

Sec. 48a. Location as Regards Schools.—No hospitals hereafter erected or established shall be within 400 feet of property used for school purposes.
Passed June 15, 1903.

Sec. 49. Stable Permits, Gas Reservoirs, Blacksmith Shops, Foundries, Packing Houses, Rendering Plants, Soap Factories, Tanneries, Breweries, Distilleries, Grain Elevators, Junk Shops, Laundries—Special Consents Necessary.—It shall not be lawful for any person, firm or corporation to locate, build, construct, or maintain on any street, or alley in the City of Chicago, in any block in which two-thirds ($\frac{2}{3}$) of the buildings on both sides of the street are used exclusively for residence purposes, any building for a livery stable, boarding or sale stable, gas reservoir, blacksmith shop, foundry, packing-house, rendering plant, soap factory, tannery, brewery or distillery, grain elevators, junk shops or laundry to be run by machinery without the written consent of a majority of the property owners, according to frontage, on both sides of such street or alley.

Such written consent shall be obtained and filed with the Commissioner of Buildings before a permit is issued for the construction or keeping of such building. Provided, that in determining whether two-thirds ($\frac{2}{3}$) of the buildings on both sides of the street are used exclusively for residence purposes any building fronting upon another street and located upon a corner lot shall not be considered."

As amended Nov. 23, 1903.

Sec. 49a. Reformatory, Rescue or Sheltering Institutions.—It shall be unlawful for any person, firm, association or corporation, other than the regularly constituted authorities of the United States, State of Illinois, County of Cook, or the City of Chicago, to build, construct, maintain, conduct or manage any reformatory, rescue or sheltering institution in any block in which two-thirds of the buildings on both sides of the street or streets on which the proposed reformatory, rescue or sheltering institution may front, are used exclusively for residence purposes, without the written consent of a majority of the property owners, according to frontage on both sides of the streets bounding said block.

"Such written consent shall be obtained and filed with the Commissioner of Buildings before a permit is issued for the construction or keeping of such building. Provided, that in determining whether two-thirds of the buildings on both sides of the street are used exclusively for residence purposes, any building fronting upon another street and located upon a corner lot, shall not be considered."

As amended April 6, 1904.

Sec. 50. Permits for Raising or Altering Buildings—Requirements.—Permits to alter or raise wooden buildings shall be given, provided they do not involve an enlargement or raising of such buildings beyond the limits of dimensions herein prescribed for frame buildings, and if the strains upon material thereof are kept within the maximum strains herein fixed for the same; and if, further, said frame building has not been damaged to any extent greater than 50 per cent. of its original value by fire, wear and tear, the action of the elements or otherwise.—T. H. O. Secs. 6 and 14.

Sec. 51. Permits for Moving Buildings—Requirements.—Written Consents Must be Obtained.—Affidavits Made.—Permits to move buildings shall be granted in accordance with the following. If said frame building has not been damaged to an extent greater than 50 per cent. of its original value by fire, wear and tear, the action of the elements or otherwise. Any person desiring to remove a wooden building shall first obtain the written assent to such removal from persons owning a majority of feet front of lots in the same block in which it is proposed to locate such removed building, and also a majority of persons owning front feet opposite the proposed location and within 150 feet of the same. And such person shall also file an affidavit subscribed and sworn to by one or more persons in the following form, as near as may be, viz:

CITY OF CHICAGO, { SS.
County of Cook, State of Illinois, }

And,.....each being duly sworn on oath, deposes and says, each for himself, that he was present and saw the persons whose names are subscribed to the above petition, sign the same, and that each and every one of said parties claimed at the time of said signature that they were the owners of the property placed opposite their respective names in the following petition, or the attorneys or agents of the owners, with full authority to sign and act for them. Subscribed and sworn to before me this.....day of....., A. D. 18....

This section shall not apply to the case of any person removing a building upon his own premises and not going upon the premises of any other person, or upon any street, alley or other public place, in making such removal.

Sec. 52. House Mover's License and Bond.—Fee for House Moving—Requirements.—No person, except a licensed house mover, shall remove any building within the limits of the city; and every such person shall annually, before engaging in said occupation,



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T. E. Reynolds, Vice-Pres. T. J. McGimsie, Treas.

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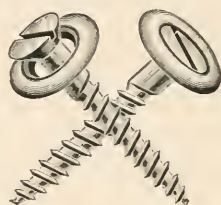
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obtain a license therefor from the Commissioner of Public Works, and no such license shall be granted until the party applying therefor shall have given a bond in the sum of \$5,000, with good and sufficient sureties, to be approved by the Commissioner of Public Works, conditional, among other things, that said party will pay any and all damages which may happen to any pavement, street or sidewalk, or to any telegraph pole or wire belonging to the City of Chicago, or to any tree or trees, whether said damage or injury shall be inflicted by said party or his agents, employes or workmen; and conditional, also, that said party will save and indemnify and keep harmless the City of Chicago against all liabilities, judgments, costs and expenses, which may in any wise accrue against said city in consequence of the granting of such permit or license, and will in all things strictly comply with the conditions of his permit.

Upon the execution of said bond and its acceptance of said Commissioner of Public Works, a license shall be issued, and the said licensed person shall in each and every instance, before removing any building, obtain a permit to do so from the Commissioner of Public Works, and shall pay to said Commissioner a fee of \$5, whereupon said Commissioner shall issue a permit, stating specifically all the conditions, describing the route to be taken, and limiting the time for removal.

The fee for a permit to remove a building from one part of a lot to another part of the same lot, or from one lot to another, when the same is owned by the same persons, and where said building or buildings are to be removed without crossing any street or alley, or the property of any person or persons, other than the owner of the lot from which the building is to be removed, shall be \$1.

Sec. 53. Violation of Building Ordinance—Revocation of Permit—Requirements for Reissue.—If work upon any building shall be conducted in violation of any of the provisions of this ordinance, either as to occupation of sidewalk or street, or the use or application of material or workmanship, it shall be the duty of the Commissioner of Buildings to revoke the permit for the building operations in connection with which such violation shall have taken place. And it shall be unlawful, after the revocation of such permit, to proceed with such building operations, unless such permit shall first have been reinstated or reissued by the Commissioner of Buildings. Before a permit, revoked for the cause or causes before mentioned, can be lawfully reissued or reinstated, the entire building and building site must be first put into condition corresponding with the terms of this ordinance, and any work or material applied to the same in violation of the terms of this ordinance shall be first removed from said building.

Sec. 54. Fire Limits.—The fire limits of the City of Chicago shall be as designated in Section 214 of this ordinance. The provisions of this ordinance as to the strength and stability of timber constructions shall also apply to the construction of frame buildings outside of the fire limits. (*For fire limits with description and map, see the end of Building Ordinances.*)

Sec. 55. Frame Buildings Outside Fire Limits.—Outside of said fire limits it shall be lawful to erect frame buildings not exceeding forty (40) feet in height from the sidewalk to the highest point of roof. If such frame buildings have a basement story of brick their height above the sidewalk may be made 45 feet.

Sec. 56. Raising Frame Buildings—Requirements.—Changing Hip Roofs to Flat Roofs.—Permission may be granted by the Commissioner of Buildings for the raising of existing frame buildings, whether within or without the fire limits, to the limits of height hereinbefore fixed for new frame buildings, and no more. The Commissioner of Buildings is also authorized to issue permits for changing gable or hip roofs of existing frame buildings to flat roofs, and for the raising of walls incident to such change. But if such hip or gable roof is changed to flat roof and the walls raised in connection with such change, the total cubic contents included by the walls so raised and the roofs so altered shall not exceed the cubic contents originally included in such gable or hip roofs.—T. H. O. Sec. 14.

Sec. 57. Repairing Damaged Buildings—Limitations.—It shall not be lawful to repair or reconstruct or remove any frame building which has been injured more than 50 per cent. of its original value by wear and tear, by the effects of the elements, or by fire, nor to occupy for human habitation any building which is declared by the Commissioner of Health to be unfit for such habitation by reason of defective sanitary conditions, until such conditions have been remedied and the premises approved by said Commissioner of Health as fit for occupancy.—T. H. O. Sec. 49.

Sec. 58. Frame Buildings—Requirements as to Lot Lines—Number—Dimensions.—Frame buildings shall not be built nearer than one foot to any line of the lot upon which they are built, street and alley lines excepted. It shall not be lawful to erect a frame building wider than forty feet nor deeper than seventy feet. If more than one frame building is built in the direction of the depth of any one lot, such buildings shall not be built with a less distance than ten feet between them.—T. H. O. Sec 18.

Sec. 59. Chimneys in Frame Buildings—Chimney Flues Through Partitions.—Chimneys in frame buildings shall be built of brick, or if built of hollow tile there shall be

a double tile wall around the smoke duct; they shall have socket joints. All joints, whether in tile or in brick chimneys, shall be well filled with mortar and neatly pointed on the outside. Brick chimneys to have flue linings of fire clay on the inside. The wood framing of frame buildings shall be trimmed around chimneys in such manner as not to come within two inches of the same.—T. H. O. Sec. 33.

Metal smoke pipes or tile flues of single thickness shall not extend through the floors or through the ceiling or roof of any building; and where such smoke pipes or tile flues pass through partitions the woodwork of such partitions shall be protected either by a course of brick built all around such smoke pipes or tile flues, or by a thimble made of bright tin, the two rings thereof being at least three inches apart, with proper ventilating holes provided in the outer covering of the same on both sides of the partitions.

Sec. 60. Frame Buildings Carried to Uniform Height.—Frame buildings, the different parts of which are of different heights, may be carried up to a uniform height, provided the aggregate height thereof does not exceed the limits of height prescribed for frame buildings.—T. H. O. Sec. 14.

Sec. 61. Basement Placed Beneath Frame Building.—A frame building may be raised for the purpose of erecting a basement story under the same, but the principal floor of such frame building shall not be raised to a higher level than six feet above the sidewalk grade for two-story buildings, or twelve feet high above the sidewalk grade for one-story framebuildings. The walls enclosing such basement shall be of masonry, and if the frame building is one story high, such walls shall not be less than eight inches thick, or if such frame building is two stories high, the basement walls shall not be less than twelve inches thick. The foundations of such walls are to be constructed as elsewhere herein stated under the head of foundations. It is provided, however, that no frame building shall be raised, for the purpose of constructing a basement under the same, to a greater height to the top of its roof, than that elsewhere herein given as the maximum height above grade for frame buildings. It is also provided that after there has been a basement story constructed under any frame building, such frame building shall not be raised again for any purpose whatsoever.—T. H. O. Sec. 14.

Sec. 62. Buildings Inside Fire Limits.—Within the fire limits of the City of Chicago, all buildings hereafter constructed, altered or enlarged, shall comply with the following:

Sec. 63. Wooden Sheds—Requirements.—Sheds not exceeding fourteen (14) feet in height from the ground at the highest part thereof, and not exceeding 256 feet in area, with an incombustible roof, may be constructed of wood; such sheds shall not be located on the front part of the lot, nor shall they be used as a dwelling, or an addition to a dwelling house, or for any business purpose whatever, nor shall more than one shed be erected on any one building lot of 25 feet.

Sec. 64. Open Shelter Sheds—Height of Walls and Foundations.—**Coal Sheds—Height—To be of Fireproof Material.**—Open shelter sheds may be constructed, provided they have incombustible roofing not over 15 feet high from the ground to the highest point of roof, and the roof supported on sufficient posts or piers. Such sheds shall have no enclosing walls or wooden floors. No fence shall be used for the back or side of such shed. If it is intended to enclose an open shelter shed the enclosing walls must be made of brick or of hollow tile. Such enclosing walls must have foundations extending to solid ground, and at least four feet below the surface of the ground. Provided, that coal sheds erected upon docks or navigable waters within said city, may be constructed not over thirty-five (35) feet high from the ground to the highest point of the roof, and when such shed shall be enclosed the enclosing walls shall be made of fireproof material.

Sec. 65. Storage and Manufacture—Stables.—Hotels and Boarding Houses.—Residences.—Assembly Halls.—Class of Building Not to be Changed Without Conforming to Ordinance.—As a means of reference in this ordinance, buildings erected within the fire limits (sheds and shelter sheds as before described being excepted) shall be divided into classes as follows:

Class I.—In this class shall be included all buildings devoted to the sale, storage or manufacture of merchandise, and all stables over 500 square feet area.

Class II.—This class shall embrace all buildings used as residences for three or more families, all hotels, all boarding or lodging houses occupied by twenty-five or more persons, and all office buildings.

Class III.—This class shall embrace all buildings used as residences for one or two families, or for less than twenty-five persons, and stables under 500 square feet area.

Classes IV and V.—These shall include all buildings used as assembly halls for large gatherings of people, whether for purposes of worship, instruction or entertainment. (See ordinance passed January 18, 1904, governing construction of Classes 4 and 5, page 121.)

If buildings, the uses of which bring them within any of the before mentioned classes, are to be applied to the uses of any other class for which a better system of construction is called for by this ordinance, the construction and equipment of such buildings must first be made to conform to the requirements of this ordinance as specified for their intended use. And it shall be unlawful to apply such building to a new or different use

than that to which its structure and equipment adapts it under this ordinance, unless the requirements of this ordinance for such new or different use shall first have been complied with, and a permit for such alteration of use shall have been first obtained from the Commissioner of Buildings.—T. H. O. Secs. 1 and 57. As to Classes II and III.

Sec. 66. Definition of Terms—Fireproof Construction.—Materials for Fireproofing.—Window Mullions.—In describing the construction of the buildings belonging to the various classes before enumerated, the following definitions of terms shall apply throughout this ordinance:

The term "Fireproof Construction" shall apply to all buildings in which all parts that carry weights or resist strains, and also all stairs and all elevator enclosures and their contents are made entirely of incombustible material, and in which all metallic structural members are protected against the effects of fire by coverings of a material which must be entirely incombustible and a slow heat conductor. The materials which shall be considered as fulfilling the conditions of fireproof covering are: First, brick; second, hollow tiles of burnt clay, applied to the metal in a bed of mortar, and constructed in such a manner that there shall be two air spaces of at least three-fourths of an inch each by the width of the metal surface to be covered, within the said clay covering; third, porous terra cotta, which shall be at least two inches thick, and shall also be applied direct to the metal in a bed of mortar.

In buildings of this type all door or window mullions, whether vertical or horizontal, shall be faced with cast iron, terra cotta or other incombustible material of equal fire-resisting values.

Sec. 67. Skeleton Construction.—Where Cast-Iron Pillars are Used—Requirements.—Fireproof Construction where Walls do Not Carry Floors or Roof.—The term "Skeleton Construction" shall apply to all buildings wherein all external and internal loads and strains are transmitted from the top of the building to the foundations by a skeleton or framework of metal. In such metal framework the beams and girders shall be riveted to each other at their respective junction points. If pillars made of rolled iron or steel are used, their different parts shall be riveted to each other, and the beams and girders resting upon them shall have riveted or bolted connections to unite them with the pillars. If cast-iron pillars are used, each successive pillar shall be bolted to the one below it by at least four bolts, not less than three-fourths inch in diameter, and the beams and girders shall be bolted to the pillars. At each line of floor or roof beams, lateral connection between the ends of the beams and girders shall be made by passing wrought-iron or steel straps across or through the cast-iron column, in such manner as to rigidly connect the beams and girders with each other in the direction of their length. These straps shall be made of wrought iron or steel, and shall be riveted or bolted to the flanges or to the webs of the beams and girders.

If buildings are made fireproof entirely, and have skeleton construction so designed that their enclosing walls do not carry the weight of floors or roof, then their walls shall be not less than twelve inches in thickness; and provided, also, that such walls shall be thoroughly anchored to the iron skeleton; and provided, also, that wherever the weight of such walls rests upon beams or pillars, such beams or pillars must be made strong enough in each story to carry the weight of wall resting upon them without reliance upon the walls below them. All partitions must be of incombustible material.

"All structural steel and iron work shall be so riveted that the distance from the center of the rivet hole to the edge of the material shall not be less than:

$\frac{5}{8}$ -inch for $\frac{1}{2}$ -inch rivets.

$\frac{7}{8}$ -inch for $\frac{3}{8}$ -inch rivets.

$1\frac{1}{8}$ -inch for $\frac{3}{4}$ -inch rivets.

$1\frac{3}{4}$ -inch for $\frac{7}{8}$ -inch rivets.

$1\frac{1}{2}$ -inch for 1-inch rivets.

Wherever possible, however, the distance from the rivet hole to the edge of the material shall be equal to two diameters of such rivet hole. All rivets, wherever practicable, shall be machine driven; the rivets in connections shall be proportioned and placed to suit the stresses, and the pitch of rivets shall never be less than three diameters of the rivets, nor more than six (6) inches. All holes shall be punched accurately, so that upon assembling a cold rivet will enter the hole without straining the material by drifting. The rivets shall fill the holes completely, and, wherever necessary, gussets shall be provided of sufficient thickness and size to accommodate a number of rivets necessary to make a connection.

When steel or iron trusses are used the trusses shall be of such design that the stress in each member can be calculated, and all trusses when placed shall be held rigidly in position by an efficient system of lateral and sway bracing, and any member of a truss subjected to transverse stress in addition to direct tension or compression shall have the stresses causing such strain added to the direct stresses coming on the member, and the total stresses shall in no case exceed the stresses provided for in Section 92 of this ordinance.

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On all buildings in process of construction, where the plans call for the use of trusses or iron and steel structural work, the erection of such iron and steel structural work and of such trusses shall be inspected daily by an inspector from the Building Department of the City of Chicago, and such inspector shall be a practical bridge and structural iron worker, and it shall be the duty of such inspector to see that the provisions of this ordinance are strictly complied with, and such inspector shall have the authority to compel the contractors and builders to use a sufficient amount of temporary bracing or guys necessary to insure the safety of the work during its erection and to compel such contractors and builders to keep all derricks, tackles and hoisting appliances used in such work in a safe condition.

Whenever the plans of any building in process of construction, where iron and steel structural work is to be used, require bolting to be done, all holes shall be reamed and turned bolts used.

As amended Feb. 19, 1900.

Sec. 68. Slow-burning Construction Defined.—Fireproof Covering of Posts and Elevator Enclosures.—The term "Slow-burning Construction," shall apply to all buildings in which the structural members which carry the loads and strains which come upon the floors and roof thereof are made wholly or in part of combustible material, but throughout which the combustible as well as the incombustible materials shall be protected against injury from fire, by coverings of incombustible, non-heat-conducting material similar to those described under the head of "skeleton construction," except that a single covering of plastering on metal lath and metal furring shall be considered sufficient protection for the underside of joists, and that a deafening of mortar or its equivalent applied at least one and one-half inches thick shall be used to cover all floors and roof surfaces above the joists of the same. Where oak posts of greater sectional area than one hundred square inches are used, they need not have special fireproof covering. All partitions and all elevator enclosures in buildings of this type shall be made entirely of incombustible material. The use of wood furring or of stud partitions shall not be allowed in buildings of this class.

Sec. 69. Mill Construction Defined.—Fireproofing.—The term "Mill Construction," shall apply to all buildings in which all the girders and joists supporting floors and roof have a sectional area of not less than seventy-two square inches, and above joists of which there is laid a solid timber floor of thickness not less than three and three-fourths inches thick. Wooden posts used in buildings of this class shall not be of smaller sectional area than one hundred square inches. Partitions and elevator enclosures in buildings of this class shall be made entirely of incombustible material. If iron pillars, girders or beams are used in buildings of this class, they shall be protected as provided for fireproof buildings; but the wooden posts, girders and joists need not be protected by fireproof covering. The use of wood furring, wood laths or stud partitions shall not be permitted in buildings of this class.

Sec. 70 Ordinary Construction Defined.—By the term "Ordinary Construction," as used in this ordinance, is meant the ordinary system of construction in which timber and iron structural parts are not protected with fire-resisting coverings.

Sec. 71. Materials.—Materials used in the construction of buildings of all classes shall conform to the following specifications:

Sec. 72. Foundation Proportions.—Foundations—How Constructed.—Foundations shall be proportioned to the actual average loads they will have to carry in the completed and occupied building, and not to theoretical or occasional loads.

Foundations shall be constructed of either of the following: Cement concrete, dimension or rubble stones, sewer or paving bricks. If iron or steel is used, filling and coating of same shall be of Portland cement; timber piles covered with grillage of oak timber or concrete. It being provided that where oak grillage is used the top of such grillage must be at least one (1) foot below city datum; wherever sewers in adjoining streets or alleys are below city datum then the top of such oak grillage must be at least one (1) foot below the bottom of such sewers.

Sec. 73. Pile Foundations—Borings Required—Safe Load Required—Fiber Strain.—Where pile foundations are used, borings of soil shall first be made to determine the position of the underlying stratum of hard clay or rock, and the piles shall be made long enough to sustain the required load according to approved formulas for pile driving, and such piles shall not be loaded more than 25 tons to each pile. The heads of the piles are to be protected against splitting while they are being driven, and after having been driven the piles are to be sawed off to uniform level and covered with an oak timber grillage, so proportioned that in the transmission of strains from pile to pile the extreme fiber strain in the timbers composing the grillage shall not be more than twelve hundred pounds to the square inch.

Sec. 74. Foundations Other than Pile.—If foundations of other materials than piles are used, they shall be so proportioned that the loads upon the soil shall not exceed the limits for different kinds of soil than those hereafter given, to-wit:

Sec. 75. Load for Clay Fifteen Feet Thick.—If the soil is a layer of pure clay at least fifteen feet thick, without admixture of any foreign substance excepting gravel, it shall not be loaded more than at the rate of 3,500 pounds per square foot. If the soil is a layer of pure clay at least fifteen feet thick and is dry and thoroughly compressed, it may be loaded not to exceed 4,500 pounds per square foot.

Sec. 76. Load for Sand Fifteen Feet Thick.—If the soil is a layer of dry sand fifteen feet or more in thickness, and without admixture of clay, loam or other foreign substance, it shall not be loaded more than at the rate of 4,000 pounds per square foot.

Sec. 77. Load for Mixed Soil.—If the soil is a mixture of clay and sand, it shall not be loaded more than at the rate of 3,000 pounds per square foot.

Sec. 78. Foundations in Wet Soil—Trenches to be Drained.—In all cases where foundations are built in wet soil, it shall be unlawful to build the same unless the trenches in which the work is being executed are kept free from water by bailing, pumping or otherwise, until after the completion of work upon the foundations.

Sec. 79. Foundation—Where Not Permitted.—Foundation shall not be laid on filled or made ground, or on loam, or on any soil containing admixture of organic matter.

Sec. 80. Depth Below Surface—Least Limit.—Depth Regulated by Sewer—Exceptions.—Sewer Connections to be First Laid.—Foundation of Brick Wall Upon Wooden Sills.—Level of Sills Allowed.—Foundations must in all cases extend at least four feet below the surface of the ground upon which they are built, and in the case of all buildings forty feet or more in height, foundations shall extend at least to the depth drained by the street sewer in the neighboring streets or alleys; but if such sewers are at a greater depth than ten feet below the sidewalk grade, such foundations need not extend to a greater depth than ten feet, provided that sound, hard soil is found at that depth. In all cases a connection with the street sewer shall be established before beginning the work of laying foundations; excepting and providing that buildings not exceeding one story in height and eighteen feet in height from top of sills to highest point of roof, and side walls not exceeding twelve feet in height, and floor area not exceeding 1,200 feet in superficial area, may have brick walls not less than eight inches in thickness, erected on wooden sills, the sills supported on vertical posts, or piers, sunk four feet below the surface of the ground. The foundations under such posts or piers shall be of wood or stone, each covering not less than five square feet area to support the weight that may rest upon them with safety; sills to be placed not higher than one foot above the established grade on the street fronting the lot upon which the building is erected, where grades are established, and not exceeding six feet above the ground where grades are not established, the sills and space from sills to the ground to be protected with fireproof material.

Sec. 81. Broken Stone—Sand.—Cement.—Concrete—Mortar—Foundations of.—Broken stone for concrete in making foundations must be clean and free from dirt and dust. All sand must be free from admixture of loam, and must be otherwise clean and sharp.

Cement must have been kept dry, and must be used fresh from the package; cement which has been permitted to become wet, hard or lumpy before it is mixed into the mortar or concrete, shall not be used.

The use of concrete or mortar of all kinds, the ingredients of which are not thoroughly and completely mixed, and which are not free from lumps or other unmixed portions of any of the ingredients, is prohibited; and also the use of cement mortar which has become partly or wholly set before use. Concrete foundations wherever used must have boxes of plank all around them, and the concrete must be well rammed in individual layers not more than six inches each in thickness. The ramming must be continued until the water stands on the top of the mass of concrete.

Sec. 82. Steel Rails on Beams in Concrete.—If steel or iron rails or beams are used as parts of foundations, they must be thoroughly imbedded in a concrete, the ingredients of which must be such that after proper ramming, the interior of the mass will be free from cavities. The beams or rails must be entirely enveloped in concrete, and around the exposed external surfaces of such concrete foundations there must be a coating of a standard cement mortar not less than one inch thick.

Sec. 83. Concrete Foundations—Steps—Safe Load Where Reinforced by Beams.—If concrete foundations are used by themselves and without the insertion of iron or steel beams or rails, the offsets on top of same shall not be more than one-half the height of the respective courses, and such concrete foundations must not be loaded more than 8,000 pounds per square foot. If reinforced by iron or steel beams or rails, the loads and offsets in the same must be so adjusted that the fiber strain upon the metal, if iron, shall not exceed 12,000 pounds per square inch, or, if steel, that the fiber strain shall not exceed 16,000 pounds per square inch.

Sec. 84. Dimension Stone.—Safe Load.—Dimension stones must have uniform beds, and the offsets in the same, where two or more layers are used, must not be more than

three-quarters of the height of the individual stones. They must be set with full beds of cement mortar under their entire area, and in such manner that they will not rock after being set. Dimension stone in foundations shall not be subjected to a load of more than 10,000 pounds per square foot in piers.

If the beds of the stones are dressed and leveled off to uniform surface and the stones are set in a standard cement mortar, this strain may be increased to 14,000 pounds per square foot.

Sec. 85. Rubble Stone.—Rubble foundations and rubble walls must be built of approximately square and flat-bedded stones, well and thoroughly bonded in both directions of the walls, each stone thoroughly bedded in mortar under its entire area. Wherever walls of any kind are used as curb walls, their exterior surfaces must be rendered approximately water-tight by a coating of a standard cement mortar.

Sec. 86. Use of Soft Brick — Bond—Safe Load.—The use of soft bricks is prohibited in all parts of buildings exposed to the weather and in internal or external piers. The bond of brickwork shall be formed by laying one course of headers for every five courses of stretchers. Brickwork in walls laid in a standard Portland cement mortar shall not be loaded more than 25,000 pounds per square foot. Brickwork laid in an ordinary cement mortar shall not be loaded more than 18,000 pounds per square foot. Brickwork in walls laid in lime mortar shall not be loaded more than 13,000 pounds per square foot.

Sec. 87. [Walls — Ledges.]—Whenever walls sixteen inches or less in thickness shall be used for the support of ordinary joists in buildings of Classes I., IV., and V., ledges four inches wide shall be formed for the support of such joists. In buildings of all classes where furring strips, whether combustible or incombustible, are used on brick walls, there shall be ledges equal to the thickness of such furring strip upon such walls, and in all cases where ledges are built, they are to be carried up to and leveled off on the line of the tops of the joists.

As amended June 18, 1902.

Sec. 88. Pressed Brick Facing—Bond Joints.—If pressed brick facings are used they must be bonded into their backing every seventh course. Bond shall be established by solid headers or by blind headers. In the case of piers faced with pressed brick only solid headers shall be used, but bond stones or iron bond plates may be substituted for such headers. Pressed brick in all cases must be so laid as to have full bed of mortar under its entire surface. The laying of pressed brick merely with a joint all around the outer edge of the bricks shall be unlawful."

Passed April 6, 1904.

Sec. 89. Brick Piers — Offsets — Bond Stone — Cap Stone.—In building brick piers, there shall be provided at every offset in each pier, or at every point where such brick pier receives the load, a bond stone at least eight inches thick, and at the top of each pier a capstone at least ten inches thick, or in all such cases a bond plate of cast or rolled iron, which stones or plates if at the top of such piers shall cover the entire surface of such pier, and shall in all cases be adapted to receiving the load to be imposed and shall be made of a strength which will keep the fiber strain upon the material used within the limits elsewhere herein stated.

Sec. 90. Arches for Support of Floors.—Hollow tile and porous terra cotta may be used in the form of flat arches for the support of floors and roofs; such floor arches having a height of at least two inches for each foot of span. The arches must be so constructed that the joints of the same point to a common center; the butts of the arches shall be carefully fitted to the beams supporting them; and there shall be a cross rib for every six inches or fractional part thereof in height; and in addition to these there shall also be diagonal ribs in the butts. Floor arches made in the form of a segment of a circle or ellipse must be constructed upon the same principle. Such arches, whether flat or curved, shall have their beds well filled with mortar, and the centers shall not be struck until the mortar has been set.

Where hollow tile blocks are used for building partitions or as enclosing walls, the joints shall be well filled with mortar.

Sec. 91. Stone Facing Without Bond Courses.—Stone Facing With Bond Courses.—Stone may be used as facing for brick walls under the following conditions: If the facing is ashlar, without bond courses, and the individual courses thereof measure in height between bond stones more than six times the thickness of the ashlar, then each piece of ashlar facing shall be united to the brickwork with iron anchors at least two to each piece and reaching at least eight inches over the brick wall, and hooked into the stone facing as well as the brick backing. Wherever ashlar as before described is used, it shall not be counted as forming part of the bearing surface of the wall, and the brick backing shall be of the thickness of wall herein specified for the different kinds of building.

If stone facing is used with bond courses at a distance apart of not more than four times the thickness of the ashlar, and where the width of bearing of the bond courses

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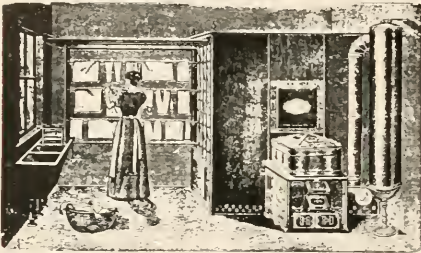
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upon the backing of such ashlar is at least twice the thickness of the ashlar, and in no case less than eight inches, then such ashlar facing shall be counted as forming part of the wall, and the total thickness of wall and facing shall not be required to be more than herein specified for walls of the different classes of buildings.

Sec. 92. Stresses — Cast-Iron Fiber — Strains — Length. — Stresses in Pounds per Square Inch.—The stresses in materials hereafter used in construction produced by the calculated strains due to their own weight and applied loads, shall in no case exceed the following:

CAST IRON.

Extreme fiber strains tension..... 2,500 lbs.
For columns.....10,000 lbs.
Reduced by Gordon's formula. Reduced for eccentric load.
No cast-iron column shall have a length to exceed twenty times its diameter, or least side.

STRESSES IN POUNDS PER SQUARE INCH.

	Wrought Iron.	Steel.
Extreme fiber stresses, I beams and shapes.....	12,000	16,000
Extreme fiber stresses, built beams.....	10,000	15,000
Tension.....	12,000	15,000
Shearing.....	7,500	10,000
Direct bearing pins and rivets.....	15,000	20,000
Bending on pins.....	18,000	22,500
*For columns and compression members.....	12,000	15,000
*Reduced for ratio of length of column to its last radius of gyration by approved modern formulae. Reduced for eccentric load.		

Sec. 93. Timber—Stresses in Pounds per Square Inch.—Posts—Stresses per Square Inch.—

TIMBER—STRESSES IN POUNDS PER SQUARE INCH.

	On Extreme Fiber.	Shearing Along Grain.	Compression Perpendicular to Grain.
White pine and spruce.....	750	80	150
White oak.....	1,000	150	250
Long-leaved yellow pine.....	1,250	100	250

POSTS WITH FLAT ENDS.

- L. Length of post in inches.
D. Least side or diameter of post in inches.
S. Stress per square inch.

White Pine and Spruce.				L. L. Yellow Pine.				White Oak.			
L. D.		S.		L. D.		S.		L. D.		S.	
0-10	625	....		0-15	1,000	....		750	....	
10-35	500	....		15-30	875	....		650	....	
35-45	375	....		30-40	750	....		560	....	
45-50	250	....		40-45	625	....		400	....	
....	...	....		45-50	500	....		375	....	

Sec. 94. Fireproofing Defined. — Protection of Steel. — Support of Fireproofing for Same.—Fireproofing of the steel and iron structural parts of buildings shall, for the purposes of this ordinance, be defined as follows:

All iron or steel used as a supporting member of the external construction of any building exceeding 90 feet in height, shall be protected as against the effect of external changes of temperature and of fire, by a covering of brick, terra cotta or fire clay tile, completely enveloping said structural members of iron and steel. If of brick, it shall not be less than 8 inches thick. If of hollow tile, it shall not be less than 8 inches thick, and there shall be at least two sets of air spaces between the iron and steel members and the outside of the hollow tile covering. In all cases, the brick or hollow tile shall be bedded in mortar close up to the iron or steel members, and all joints shall be made full and solid.

Wherever stone facing is used, it shall be an additional thickness to the column covering above specified.

Where skeleton construction is used for the whole or part of a building, these enveloping materials shall be independently supported on the skeleton frame for each individual story.

Sec. 95. Iron or Steel Plates for Support of Fireproofing.—If iron or steel plates are used in each story for the support of this covering within the said story, such plates must be of sufficient strength to carry within the limits of fiber strain for iron and steel elsewhere specified in this ordinance, the enveloping material for the said story, and such plates may extend to within two inches of the exterior of said covering.

Sec. 96. Backing for Terra Cotta.—If terra cotta is used as part of such fireproof enclosure, it shall be backed up with brick or hollow tile; whichever is used, being, however, of such dimensions and laid up in such manner that the backing will be built into the cavities of the terra cotta in such manner as to secure perfect bond between the terra cotta facing and its backing.

Sec. 97. Horizontal Filling—Thickness.—The horizontal filling between the iron and steel vertical members of skeleton constructions shall be of brick or terra cotta, and in no case of less thickness than 12 inches, subject to the same conditions as to bond and courses as specified for the enveloping material of structural members, and these horizontal fillings shall be bonded into the enclosures of the vertical members.

Sec. 98. Top Covering.—The upper surfaces of all breaks or offsets in external coverings and fillings and walls, as well as the tops of walls, shall be covered with stone, terra cotta or fire clay copings set in cement mortar, and having lapped joints pointed with cement.

Sec. 99. Internal Covering.—The internal structural parts of buildings of the skeleton construction shall be fireproofed by coverings of brick, hollow tile, or porous terra cotta.

Sec. 100. Covering of Interior columns.—In the case of buildings of Class I, the coverings of interior columns shall be, if of brick, not less than 8 inches thick; if of hollow tile, these coverings shall be in two consecutive layers, each not less than $2\frac{1}{2}$ inches thick. If the fireproof covering is made of porous terra cotta, it shall consist of at least two layers not less than two inches thick each. Whether hollow tile or porous terra cotta is used, the two consecutive layers shall be so applied that neither the vertical nor the horizontal joints in the same shall be opposite each other, and each course shall be so anchored and bonded within itself as to form an independent and stable structure.

In all cases there shall be on the outside of the tile a covering of plastering with any standard cement mortar or of other mortar of equal hardness and efficiency when set.

In all places where plastering is used in connection with fireproof construction, asbestos plastering or a material equally as good shall be used.

Sec. 101. Protective Covering for Fireproofing.—In places where there is trucking or wheeling or other handling of packages of any kind, the lower five feet of the fireproofing of such pillars shall be encased in a protective covering either of sheet iron or oak plank, which covering shall be kept continually in good repair.

Sec. 102. Metallic Lath Fireproofing.—In buildings of "slow burning" construction, if plastering or metallic lath be used as fireproofing for columns, it shall be in two layers. The metallic lath shall in each case be fastened to metallic furrings, and the plastering upon the same shall be made with cement. Protection for the lower five feet shall be required in this case the same as where porous terra cotta or hollow tile covering is used. In all places where plastering is used in connection with fireproof construction, asbestos plastering or a material equally as good shall be used.

Sec. 103. Fireproof Coverings for Internal Columns in Class II.—In buildings belonging to Class II, the fireproof covering for internal columns is to be made the same as specified for the buildings of Classes I, IV and V, excepting only that but one covering of hollow tile or porous terra cotta, and but two layers of any covering made of plastering on metallic lath, are to be used.

In all places where plastering is used in connection with fireproof construction, asbestos plastering or material equally as good shall be used.

Sec. 104. Covering of Iron or Steel Beams, Classes I, IV and V.—The fireproof covering of iron or steel beams and girders in buildings of Classes I, IV and V, shall be effected with either of the materials before specified. If hollow tiles are used, the tiles shall be set close to the metal to be protected, and there shall be two air spaces within the tile of at least $\frac{3}{4}$ of an inch each. If plastering on metal lath is used, the furring shall be also metal. There shall be two thicknesses of such plastering on metallic laths.

In all places where plastering is used in connection with fireproof construction, asbestos plastering or a material equally as good, shall be used.

Sec. 105. Air Space.—For buildings of Class II only one air space will be required in the fire protection covering.

Sec. 106. Limitation in Changing Class of Building.—If buildings of Class II are partly used for the purposes of Classes I, IV and V, the method of fireproofing the structural iron or steel in the whole of any story, any part of which is so used, and in the whole of the story above and below the same, shall be as called for in buildings of Classes I, IV and V. See Classes 4 and 5 Page 121.

Sec. 107. Coverings of Beams.—In all cases, the covering of beams, if of hollow tile or porous terra cotta, shall be so applied as to be supported entirely by the beams or girders protected, and shall be held in place entirely by the support of the flanges of such beams or girders, and by the mortar used in setting. Wire binding and anchors shall not be used as fastenings of such fireproof covering.

Sec. 108. Arches as Filling Between Floor Beams.—The filling between the individual iron or steel beams supporting the floors of fireproof buildings, shall be made of brick arches or concrete arches or hollow tile arches. Brick arches shall not be less than 4 inches thick, and shall have a raise of at least $\frac{3}{4}$ inches to each foot of span between the beams. If the span of such arches is more than 6 feet, the thickness of the same shall not be less than 8 inches. If hollow tile arches having a straight soffit are used, the thickness of such arches shall not be less than at the rate of 2 inches per each foot of span. If concrete arches are used, the concrete in the same shall not be strained more than 100 pounds per square inch if the concrete is made of crushed stone, nor more than 50 pounds square inch if the concrete is made of cinders. In all cases, no matter what the material or form of the arches used, the protection of the bottom flanges of the beams, and so much of the web of the same as is not covered by the arches shall be made as before specified for the covering of beams and girders.

Sec. 109. Walls—Thickness of.—The thickness of walls hereinafter specified and set forth in the tables for the various classes of buildings, shall be, for each class of buildings, intended to apply to the external enclosing walls, and also to such internal walls as may be required under the specifications of the different classes of building for the support of floors and roofs.

Sec. 110. Bay Windows and Light Shafts—Material for.—Bay or oriel windows and light shafts may be built of combustible material only in the following cases: In buildings of Classes I, II and III, of four (4) stories or less in height, provided such bay and oriel windows or light shafts shall not have a greater width than twelve (12) feet at wall line of building, and that no such bay or oriel window or light shaft shall be more than three stories in height above the first or main story of such buildings, and provided that the outside walls, roofs and soffits of such bay or oriel windows and light shafts, when so constructed, shall be covered with sheet metal or other incombustible material. In all other cases, bay and oriel windows and light shafts shall be constructed entirely of incombustible material, and all supports thereof shall be so proportioned that the limit of stress on such supports shall not exceed those hereinbefore scheduled.—T. H. O. Sec. 15.

Sec. 111. Limitations of.—The limitations of bay and oriel windows projecting over the street line of one building and the number and position of any such bay or oriel windows on any building, shall be as follows:

First—No such bay or oriel window shall be at a less distance than twelve (12) feet from the sidewalk grade.

Second—No such bay or oriel window shall project more than three feet over a street line of any building.

Third—No such bay or oriel window shall have a greater street frontage than fifteen feet.

Fourth—There shall not be more than one bay or oriel window for any twenty feet of frontage, and no two bay or oriel windows shall be built nearer to each other than five feet. Nothing herein contained shall, however, limit the number and size of bay and oriel windows which are built in such a manner as not to project over the street line of the building of which they form a part; provided, such bay or oriel windows shall be built entirely of incombustible material.—See Supreme Court ruling (*People vs. Hains*, Ill. 72.)

Sec. 112. Construction of Buildings.—Height of Buildings.—Buildings of Classes 1, 2 and 3, which are 100 feet or more in height, shall be made entirely of fire proof construction.

Buildings of Classes 1, 2 and 3, less than 100 feet and more than 60 feet in height, shall be built entirely of slow burning or mill construction.

Buildings of Classes 1, 2 and 3, less than 60 feet in height, may be built of ordinary construction.

The limits of heights of buildings, hereinbefore given for non-fire proof buildings, shall be from the sidewalk level to the highest point of roof thereof.

No buildings shall be erected in the City of Chicago of greater height than 260 feet from the sidewalk level to the highest point of external bearing walls.—T. H. O. Sec. 17.

As amended Feb. 3 and 24, 1902.

Sec. 113. Wind Pressure—Precautions Against.—In the case of all buildings, the height of which is more than one and one-half times their least horizontal dimension, allowances shall be made for wind pressure which shall not be figured at less than 30 pounds for each square foot of exposed surface. In buildings of skeleton construction the metal frame must be designed to resist this wind pressure.

Sec. 114. Basement—Meaning of.—Wherever in this ordinance the word "basement" story is used, it is intended to mean that the floor of such story is at a distance of two feet or more below the level of the sidewalk, and that its height does not exceed eleven feet in the clear. If the floor of such story is nearer than two feet to the sidewalk grade, or if its height in the clear is more than eleven feet, it shall be counted as the first story of the building in which it occurs.—T. H. O. Sub-Sec. 8, Sec. 1 and Sec. 36.

Sec. 115. Enclosures Upon Roofs.—Parapets and Balustrades Upon Roofs.—It shall be permitted to erect on the roofs of all buildings, skylights, enclosures for water tanks and enclosures for elevator machinery, the construction of all of which enclosures shall be, if sixty feet or more above the sidewalk level, entirely of incombustible material.

The erection of parapet walls or of balustrades constructed entirely of incombustible material is permitted above the roof level of buildings of all classes, and in addition to the heights herein fixed for the same.

Sec. 116. Fire Walls—When Dispensed With.—Fire walls of brick not less than twelve inches thick shall be built extending above the roofs of all buildings if such roofs are flat, and also above the roofs of all buildings where the same abut against another building, or where the same stand upon any line of any lot, excepting street or alley lines. Provided, that where 8-inch walls are permitted in the top story of buildings, the fire walls shall be of the same thickness. Such fire walls, where they stand upon lot lines or where they are over the dividing walls between buildings, or over the dividing walls in the interiors of buildings, where such are called for by this ordinance by reason of the great area of such building, shall extend at least three feet above the roofs of such buildings. Fire walls upon street and alley lines shall extend not less than eighteen inches above the roofs of such buildings. Fire walls may be dispensed with on street and alley lines if the tops of the roof boards and roof joists are protected as against fire for a distance of at least five feet from such street or alley lines by a coating of deafening mortar on hollow tile or porous tile at least two inches thick. Fire walls at street and alley lines may also be dispensed with in all cases where the entire framing and material of the roof shall be made strictly fireproof.

Walls facing upon courts and light shafts shall be treated in the same category with walls facing upon streets and alleys.

Fire walls must be covered with a weatherproof coping of incombustible material.

Sec. 117. Incombustible Window and Door Sills.—Window and door sills shall be made of incombustible material. Oak timber used for door sills and not less than eight inches thick by the full width of the wall in which such sills occur, shall, for the purpose of this ordinance, be counted incombustible, but no other form or use of wood construction shall be considered incombustible.

Sec. 118. Pillars and Lintels Supporting Store Fronts.—The pillars and lintels supporting store fronts shall not be made of wood in buildings more than twenty-five feet above the sidewalk grade.

Sec. 119. Shingle Roof.—Gravel Roof.—Construction of Roofs.—Pitch of Roofs.—Rise of Roof Above Limit of Height.—The use of shingle roofs or of other forms of combustible roof covering upon buildings erected or altered within the fire limits is prohibited.

Provided, however, that shingle roofs may be placed on all buildings not exceeding two stories in height, but the shingles used on such roofs shall first have been dipped in fire-proof paint, such fire proof paint to be approved by the Commissioner of Buildings.

Passed April 6, 1904.

Roofs whose slope is not more than three inches per foot horizontal, and the covering of which is made with a composition of felt and gravel, shall be considered incombustible under the provisions of this ordinance, and may be used upon buildings of all classes.

In the case of all buildings less than sixty feet in height, roofs having a slope of more than that specified for composition roofs may be made of timber and board construction, and shall be covered with slate or glazed tile or metal. The roofs upon buildings sixty or more feet and less than ninety feet high, and of greater slope than three inches to the foot, and less slope than thirty degrees with the horizon, shall, if made of timber construction, have a fireproof covering upon the roof boards, which shall be made either of mortar or porous terra cotta or plaster boards, and which shall be at least two inches thick. If this covering is made upon the roof boards, wooden strips shall be inserted and securely fastened to the wooden substructure at regular intervals between the fireproof covering, and a weatherproof covering of sheet metal, state or glazed tile shall be securely fastened thereto.

In the case of buildings which are entirely fireproof in their construction and of which the roof is also entirely of fireproof construction, the roof may rise above the limit of height of wall fixed by this ordinance for such buildings at a slope not to exceed thirty degrees with the horizon, and to a height not exceeding ten feet above limitation of height of such wall. The space enclosed by such roof above the legal limitation of the height of such wall may be used as an enclosure for pipes, ventilating or elevator machinery, or for ventilating ducts, but it shall not be lawful to use said attic space for purposes of storage, business or residence.

Sec. 119a. To Regulate the Congregating and Crowding on the Roofs of Houses and Buildings.

(1.) It shall be unlawful for any person, whether owner, lessee, manager or person in control or having charge of any building within the city limits of the City of Chicago to permit the use of the roof of such house or building, whether free of charge or through admission fee, to any person or persons as a place of observation or for spectatorial purposes, unless he has first obtained from the Commissioner of Buildings of the City of Chicago a permit; provided, however, it shall not be unlawful for any person, whether owner, lessee or the person in control or having charge of such house or building to permit the roof of any such house or building to be used as a place of observation or for spectatorial purposes for a number of persons not exceeding ten, and when no admission fee is charged.

(2.) Before issuing the permit, as provided for in the foregoing section, the Commissioner of Buildings shall make an investigation as to whether said building is safe and secure enough to permit the crowding of an estimated number of persons upon the roof of such house or building, and the permit so issued shall state the number of persons to be permitted on such roof.

(3.) The person requiring such permit as hereinabove provided for shall make application to the Commissioner of Buildings for such an investigation, and shall pay, as a fee for such investigation and such permit, a sum not to exceed five dollars.

(4.) Any person or persons, whether owner, lessee, manager or person having charge or control of any such house or building within the city limits of the City of Chicago who shall permit, allow or tolerate the use of the roof of such house or building so controlled by him, by any person or persons for a purpose within the meaning of this ordinance without first obtaining a permit as hereinabove provided for and without having the safety of such roof tested and investigated by the Commissioner of Buildings as herein provided for, or permitting a larger number of persons than provided for in his permit to congregate upon such roof, shall be fined for each and every violation of this ordinance in a sum not less than \$20 nor more than \$100.

Passed January 14, 1901.

Sec. 120. Pipes Carrying Water from Roof.—The water from all roofs shall be carried to the street sewers in metal conductor pipes, which must be continually maintained in such condition that leaks therein will not cause the water to soak into the walls or any other part of the building.

Sec. 121. Cornices — Gutters — Eaves — Parapets — Bay Windows. — Where sheet metal cornices or external sheet metal gutters are used, their entire framework and covering shall be of metal, and the walls shall extend behind all such cornices or gutters along their entire height. All metal work in and about any cornice, gutter, eave or parapet, or in or about any bay, or oriel window, shall be supported by suitable brackets placed not more than four feet apart and firmly secured to the wall. Wood shall not be used as the support of any gutter or cornice for buildings of one hundred feet or more in height.

Sec. 122. Towers, Domes and Spires—Construction of.—Towers, Domes and spires may be built on top of the roofs of buildings of Classes I, II and III but shall not occupy more than one-fourth of the street frontage of any building, and none shall in any case have a base area of more than 1,600 square feet. And such towers, domes or spires, if any part thereof is built to a height of more than sixty feet and less than ninety feet, shall be of slow-burning construction, and if of greater height than ninety feet above the sidewalk shall be of fireproof construction; and in all cases where the area of such spire, dome or tower exceeds one hundred square feet, its supports shall be carried down to the ground, and shall be, if the construction supported is more than sixty feet and less than ninety feet high, of slow-burning construction, and if more than ninety feet high, of fireproof construction.

Sec. 123. Skylights—Construction of.—Glass in.—Any skylight on the roof of any buildings of Classes I and IV and Class II over two stories in height, shall have the sides, sashes and frames constructed of metal; or of wood metal clad on all exterior surfaces.

The glass in all skylights shall have, at least six inches over same, a strong wire netting (wire not lighter than No. 8 and mesh not coarser than 1½ inch by 1½ inch), unless the glass contains a wire netting within itself.—T. H. O. Sec 28.

Sec. 124. Projection of Cornices—Belt Courses—Balconies.—Verandas — Porticos — Balconies — Construction of. — No cornice, belt course or balcony shall project more than three feet over the street line of any building, nor be less than twelve feet above sidewalk grade, and no cornice, balcony, string course, portico or veranda, if projecting over the street line of any building, shall be built in its entirety of other than incombustible material. It shall, however, be permitted to build verandas, porticos and balconies upon buildings less than sixty feet in height of combustible material, provided that no part thereof projects over the street line of the buildings of which they form part.

If verandas or porticos are to be enclosed the filling or enclosing walls must be made of incombustible material, the only exception being in case such porticos or verandas are

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to be made part of a storm house or of a storm door enclosure, which, however, shall in no case be more than twelve feet high, nor shall it occupy a greater frontage than two feet more than the width of the inner doors for which the storm doors are made. Permits for the erection of such storm houses or storm door enclosures may be issued subject to the provision that the same shall be maintained only from the first of November to first of May following, and that the storm house or storm door enclosure, for which such permit is issued, shall not be used for the display of merchandise or any other thing whatsoever, but shall be used only for protection from severe and inclement weather. Such storm houses or storm door enclosures shall not extend more than three feet beyond the building line of the building in front of which the same shall be erected. The fee for each permit for storm house or storm door enclosure shall be two (\$2) dollars.

Sec. 125.—Sidewalks—Occupation of by Parts of Buildings.—The use of any part of the sidewalks for steps or for open areas is prohibited, but porticos or other entrance features, if not more than thirty feet in height, may be made to project upon the sidewalk thirty inches, but no more. Provided, that where sidewalk space is less than fourteen feet, no projection shall be permitted, and provided that such projection shall only be as an architectural feature and shall in no case be used as a show window, vestibule or for business purposes.

The foregoing prohibition for the use of sidewalk space for steps or areas shall not apply to existing buildings, but if material alteration in or additions to existing buildings are to be made, then such steps and open areas shall be made to conform to the provisions of this ordinance.—See Supreme Court ruling (*People vs. Hains*, Ill. 72.)

Sec. 126 Space Beneath Sidewalks.—In all cases where the space under sidewalks is connected with the basement of any building, the covering of the same and all the supports of such covering shall be made entirely of incombustible material, and the occupant of such space under any sidewalk shall be considered and treated as the tenant at will of the City of Chicago.

Sec. 127. Height Above Roof. — Interior Chimneys — Walls of. — Flues — Height Above Roof. — Flues — Linings of. — Interior Chimneys — Framing Around.—No chimney shall be built with less than four (4) inches thick brick walls, and no chimney having a greater flue area than 260 square inches shall have walls less than eight (8) inches thick; provided that in all cases where chimneys are built with walls less than eight inches thick the same shall have flue liners of fire clay or terra cotta in their entire length.—T. H. O. Sec. 33.

All chimneys having an area of not more than 260 square inches or less, shall be carried up to at least five feet above the highest part of roof of the building of which it is a part, if such roof is a flat roof. If the roof is a pitched roof, the chimney shall be carried up at least two feet above same.

Chimneys having a greater flue area than 600 square inches shall have surrounding walls of at least sixteen inches of brickwork, and such walls shall be built hollow with at least four inches hollow space in such walls. At a height of fifty feet above smoke inlet the thickness of the surrounding brickwork can be reduced to twelve inches, but in all cases the surrounding walls of chimneys of this or any other size shall be so proportioned that the brickwork in same will not be subject to a greater stress than elsewhere herein fixed as the maximum safe stress for brickwork. For chimneys having a greater flue area than 1,600 square inches the thickness of walls shall be increased above the thickness above specified, four inches for each increase of 1,000 square inches or fractional part thereof.

All flues having a greater area than 250 square inches and not more than 600 square inches, shall be carried up at least twelve feet above highest point of roof of building of which they form part; and all flues having a greater area than 600 square inches and not more than 900 square inches, shall be carried up at least twenty feet above highest point of roof. All chimneys having a greater area than 900 square inches shall be carried to a height of at least twelve feet above any roof within a radius of sixty feet; provided, that the top of such chimney shall not be less than twenty feet above the roof of the building of which it forms a part.

All flues having a greater area than 400 square inches shall be lined on the inside with fire brick laid in fire clay, which lining shall start at least two feet below the smoke inlet, and for flues having an area of from 400 to 600 square inches shall extend twelve feet above smoke inlet, and for all flues of more than 500 square inches and not more than 1,600 square inches, shall extend twenty feet above smoke inlet, and for all flues having a greater area than 1,600 square inches shall extend at least thirty feet above smoke inlet. If an internal smoke pipe of cast-iron or steel is used, so much of the brickwork as is inside of the insulating cavity of the stack may be omitted. Wrought-iron or steel smoke stacks shall, however, be lined with fire brick for at least thirty feet of their height.

No joists or girders shall rest and be supported on the walls of any chimney, and the framing around chimneys of all kinds shall be so constructed that in no case will any joists or timbers be placed nearer than two inches from the outside face of walls of

flues, and in no case shall the distance from the inside of any flue to any joists or timbers be less than eight inches, where flue liners are used, and twelve inches where flue liners are omitted.

The foregoing applies only to chimneys which are enclosed by, or form part of, the interior of any building.

Sec. 128. External Chimneys—Location of.—Walls of Abutting Building.—Built of Iron or Steel.—Isolated Chimneys.—Foundation of Smoke Stacks.—Chimneys may be built outside of the walls of existing buildings (but not in such manner as to encroach upon any street or alley) and shall be built as follows:

If at least one side of such chimney abuts entirely upon the wall of an existing building and the chimney is throughout its entire length securely and firmly anchored to the walls of said existing building, the wall of such chimney may be built of hollow tiles, in which case, however, it shall have a cast-iron base, lined with fire brick, and extending to a height of at least ten feet above the street or alley grade.

Such external chimney may also be built of rolled steel or iron of not less than one-fourth inch thick and lined with fire bricks, laid in fire clay, for at least forty feet above street or alley grade, or it may be built throughout its entire height of cast iron, in which case the first ten feet above street or alley grade shall be lined with fire brick, laid in fire clay.

If isolated chimneys are built, they shall also have hollow walls, and shall be so designed and constructed that the stress upon any part thereof, due from the weight of the stack itself and from wind pressure, shall never exceed the limits elsewhere in this ordinance fixed as the maximum stress for brick masonry.

The foundations of smoke stacks, whether inside or outside of buildings, or whether connected with the same or isolated, shall be designed and built in conformity with the provisions relating to foundations of buildings hereinbefore given.

Sec. 129. Metallic Chimneys Passing Through Floors and Roofs.—Metallic chimneys or smoke pipes shall not be used inside of any building in such manner as to pass through the floors or roofs of the same, unless such metallic smoke pipes or chimneys are enclosed in brick or tile walls, with an air-space between the enclosing walls and the smoke pipe from bottom to top.

Sec. 130. Smoke Pipes Passing Through Partitions.—**Smoke Flues — Woodwork Around.**—Where smoke pipes of diameter twelve inches or less pass through a wood or a plastered stud partition, they shall be surrounded either by a body of brick, hollow tile, porous terra cotta or other substance, measuring at least eight inches all around such smoke pipe.

Smoke flues of less diameter than twelve inches shall be kept at least twelve inches distant from any woodwork, and such woodwork immediately over and for a distance of two feet on each side of such smoke pipe must be covered with sheet metal or with porous terra cotta or hollow tile or with plaster.

Smoke pipes of greater diameter than twelve inches and less area than six square feet, must be kept at least twenty inches away from any woodwork, and such woodwork must be protected as before specified for the smaller smoke pipes to a distance of four feet on each side of such smoke pipe.

Wherever smoke pipes of larger area than six square feet are used they shall be kept at least three feet distant from any woodwork, and such woodwork for a distance of at least six feet on either side of said smoke pipe shall be protected as before specified for smaller pipes.

Sec. 131. Floors, Protection of—Around Boilers, Furnaces, Etc.—Ceiling, Protection of—Around Boilers, Furnaces, Etc.—Wherever steam boilers or furnaces or ovens, coffee roasters or other structures in which fires are maintained, are set inside of a building or in a room with wooden floor or ceiling construction, the floor of the same shall be protected by a covering of brick or concrete not less than five inches thick set in mortar upon a continuous sheet-metal bearing plate not less than 3-16 of an inch thick, all the joints of which are to be securely riveted and the edges of which are to be turned up five inches all around. This foundation of sheet metal and brick and concrete shall extend under the whole of the fire box and ash pit of such steam boiler or furnace or other structure, and to a distance of not less than ten feet in front and at least four feet on the other three sides of the same. The space between the tops of such steam boilers or furnaces and any wood ceiling construction shall in no case be less than three feet, and the under side of such wood ceiling construction shall in all cases be protected either by two consecutive coatings of plastering on metallic lath or wire netting, which shall be kept at least two inches distant from each other, and which metallic lath or wire netting shall be applied by means of metal furring strips, or this protection of the woodwork shall be made by a covering of at least two inches of porous terra cotta plastered on the under side, or by a covering of hollow tile with two air spaces at least $\frac{1}{2}$ inch each between the wood and the under surface thereof, which under surface shall also be covered with a heavy coat of plastering.—T. H. O. Sec. 34.

Sec. 132. **Cupolas of Foundries.**—Cupolas of foundries shall extend at least ten feet above the highest point of any roof within a radius of forty feet of such cupola and shall be covered on top with wire netting.

Sec. 133. **Pipes for Distribution of Hot Air.**—Where pipes are used for the distribution of hot air in buildings, such pipes must be made of metal and double. The space between the two metal pipes shall be at least ½ inch. Such pipes are to be made with air-tight joints and to be securely fastened to the partitions through which they pass.

Sec. 134. **Registers—Openings in Floor For.—Material for Ducts, Pipes and Registers.**—The openings in floors for hot air registers shall be surrounded with borders of incombustible material not less than two inches wide, and firmly and securely set in place, and bedded in plaster of paris. The register boxes shall be double, the distance between the two thicknesses of tin being at least one inch.

Where the air conveyed through pipes is heated in an ordinary hot-air furnace, or in any other apparatus, by direct contact of the air with a fire box, the material used for these double ducts, pipes and register boxes shall be in bright tin, and the joints shall be double-seamed, but not soldered. Where the air is heated by contact with hot water or steam pipes, any other sheet metal may be used for the pipes, and the use of double pipes is not obligatory.

Sec. 135. **Thickness of Walls of Class I.**—The following regulations shall govern the construction of buildings belonging to Class I:

The thickness of their surrounding walls and of all dividing walls in the same, carrying the load of floors or roof, shall be made as indicated in the following table, to-wit:

	Basement.	STORIES.											
		1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.
One-story.....	12	12	....	....	....	....	....	....	....	....	....	....	....
Two-story.....	16	12	12	....	....	....	....	....	....	....	....	....	....
Three-story.....	16	16	12	12	....	....	....	....	....	....	....	....	....
Four-story.....	20	20	16	16	12	....	....	....	....	....	....	....	....
Five-story.....	24	20	20	16	16	16	....	....	....	....	....	....	....
Six-story.....	24	20	20	20	16	16	16	....	....	....	....	....	....
Seven-story.....	24	20	20	20	20	16	16	16	....	....	....	....	....
Eight-story.....	24	24	24	20	20	20	16	16	16	....	....	....	....
Nine-story.....	28	24	24	24	20	20	20	16	16	16	....	....	....
Ten-story.....	28	28	28	24	24	24	20	20	20	16	16	....	....
Eleven-story.....	28	28	28	24	24	24	20	20	20	16	16	16	....
Twelve-story.....	32	28	28	28	24	24	24	20	20	20	16	16	16

Sec. 136. **Stairs, Shafts, Shaving Pits—Walls Surrounding. — Ventilating Ducts, Chutes — Walls Surrounding.**—The walls surrounding stairs, and also the walls of elevator shafts and shaving pits, shall not be less than eight inches thick, and their thickness shall be increased with increase of height to a sufficient extent to keep the load on the brickwork within the maximum load elsewhere herein specified. No 8-inch wall shall be more than two stories high and not more than twelve feet high between lateral supports. Walls surrounding ventilating ducts, and rubbish and ash chutes, shall be constructed in accordance with the regulations governing the construction of smoke flues elsewhere herein contained.

Sec. 137. **Exception to Table of Thickness of Walls.**—If buildings of Class I are erected of less depth than 100 feet from front to rear or between cross walls, or if the walls supporting their floors and roofs are less than twenty-five feet apart, the thickness of the walls given in the aforesaid table may be reduced by four inches, excepting only that no wall in such buildings shall be less than twelve inches thick.

Sec. 138. **Ice Houses.**—Houses to be used exclusively for the storage of ice may be constructed of wood with incombustible roofing, the walls to be enclosed with an envelope of incombustible material; 8-inch brick walls with proper foundations of masonry may be used for such envelopes; iron or slate may be used, but no coating of mineral substance, or "fireproof paint," so called, shall be considered as incombustible, and such houses shall be used for no other purpose than the storage of ice.

Sec. 139. **Stairs in Class I.**—In buildings of Class I, which are used as workshops or in which, if they are used as salesrooms, there is an occupation of the same at any time by 100 or more persons, there shall be at least two staircases, each not less than four feet wide. If the number of persons occupying such buildings exceeds 300, then the width of the stairs in the same shall be increased to five feet. If the number of persons occupy-

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ing such premises exceeds \$800, three stairways five feet in width each shall be constructed. And if the number of persons occupying such premises exceeds 1,200, they shall be governed as regards the number, size and construction of stairways, by the regulations laid down for buildings of Class IV.

In all cases the stairs shall be located at as great a distance as practicable from each other.

The foregoing specifications as to stairs apply to non-fireproof buildings only. For fireproof buildings, one less flight of stairs than above called for may be sufficient in each case, unless the floor area exceeds 7,000 square feet, in which case there shall not be less than two stairs in any building of Class I.

And no stairways shall hereafter be constructed around or alongside elevator shafts in buildings over four stories in height, unless said stairways are separated from the elevator shaft by a fireproof wall.

Sec. 140. Stairs and Fire Escapes—Obstruction of.—It shall be unlawful, under any circumstances, to close up or obstruct during the occupation for business purposes of any building, the stairs or fire escapes or the approaches leading thereto, and no change in the position or construction of either shall be made, unless the permission so to do of the Building Department first shall have been obtained.

Sec. 141. Door Openings at Street Level—Class I.—The aggregate width of door opening at the street level in buildings of Class I shall be equal to the aggregate width of stairways hereinbefore specified, and such doors shall not be locked during business hours or while such buildings are occupied by large numbers of people.

Sec. 142. Increasing Height of Class I.—In all cases where buildings of Class I, already built, of ordinary construction, are to be increased in height above the height of 60 feet or above the height of 100 feet, the additional parts of such buildings shall be constructed as herein provided for buildings over 60 feet high or over 100 feet high, respectively, and shall be made to conform in all respects and throughout their entire extent to the requirements of buildings of this class more than 60 feet or 100 feet high, respectively, before it shall be lawful to occupy them.

Sec. 143. Space Between Ceiling and Roof of Class I.—In buildings of Class I, if the enclosed space between the ceilings and the roof is of less average height than six feet, then the ceiling and roof and all the structural parts of the same are to be made either of "mill construction," or "slow burning;" and in all cases means of access satisfactory to the Fire Marshal shall be given to this space between ceiling and roof.

Sec. 144. Doors and Windows When Provided with Shutters.—Wherever the distance between doors and windows of buildings on opposite sides of alleys or courts shall be 30 feet or less, such door or window openings shall be provided with shutters made of iron, wire glass or prisms, not exceeding four inches square, glazed in fireproof metal. The wire glass or the prisms to be set in hollow iron frames.

Sec. 144a. Cleaning Windows, Safety Devices.

(1.) That the owner or agent of every building hereafter to be erected in the City of Chicago coming within the description of Classes 1, 2, 4 and 5, as classified in and by an ordinance passed by the City Council of the City of Chicago on the twenty-eighth day of March, 1898, known as the Building Ordinance, shall equip each and every window in any such building, above the second story thereof, with a suitable device or devices which will permit the cleaning of the exterior of each and every window in such building, above the second story, without danger to the person or persons cleaning such windows, such device or devices to be of such pattern and construction as will reasonably answer the purposes for which they are intended.

(2.) Any owner or agent of any building described in the foregoing section who shall fail, neglect or refuse to comply with the provisions of this ordinance within ninety (90) days from the date of the passage of this ordinance, shall be deemed guilty of a misdemeanor and shall upon conviction thereof be fined a sum not less than ten (\$10.00) dollars nor more than fifty (\$50.00) dollars; and each and every day which shall be allowed to elapse after the expiration of ninety (90) days from the date of the passage of this ordinance, before any such building described in Section 1 hereof shall be supplied and equipped in accordance with the provisions of this ordinance, shall constitute on the part of the owner or agent of any such building a separate and distinct offense.

Passed June 29, 1900.

Sec. 145. Dividing Walls—When Required in Class I.—Dividing walls will be required in buildings of Class I as follows: For buildings of ordinary construction if their floor area exceeds 9,000 square feet; for buildings of slow-burning or mill construction if their area exceeds 12,000 square feet; for fireproof buildings if their area exceeds 15,000 square feet. In each of the before mentioned cases such buildings shall be subdivided by brick walls built of the thickness given in the table for the thickness of enclosing walls, and all doors and other openings in such walls shall have iron doors or shutters at each side of same. And the buildings so subdivided shall be treated as regards stairs and fire escapes the same as two or more separate buildings.

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Sec. 146. **Openings Inserted in Dividing Walls.**—If openings are to be inserted in dividing walls, as before described, or in dividing walls between non-fireproof and fireproof buildings or parts of buildings, they shall be made as follows:

They shall have doors placed on each side of each opening in such walls, which doors shall be made of No. 12 plate iron with a continuous 2 by 2 by $\frac{3}{8}$ inch angle iron frame extending all around the same and the plate riveted thereto with $\frac{1}{2}$ -inch rivets, placed four inches between centers. If such doors are made double they must have cross bars, levers, and hooks so arranged that when the doors are closed they will be of strength equal to that of a single door. All doors must be hung on frames made of $\frac{3}{4}$ by 4 inch iron stiffened with an angle iron extending all around the same and fitting up snug to the wall. The frames must be fastened to each other by bolts extending through the wall, such bolts being not more than two feet apart, and such doors must swing on three hinges, and must be made to fit closely to the frame all round. The sills between the doors must be of brick, iron, stone or concrete, and must rise at least two inches above the floor on each side of each opening. The lintel over the door must be made of brick or iron, and the wall between the two door frames must be covered with a coat of plaster at least $\frac{1}{2}$ inch thick.

Sec. 147. **Elevator Buildings—Bins of.**—**Cupola and Enclosure Walls of.**—**Outside Openings Into.**—**Openings in Body of First Story and in Boiler Houses.**—Elevator buildings (which term shall be interpreted as including all buildings intended solely for the receipt, storage and delivery of grain in bulk) may be constructed with bin walls, both externally and internally, made entirely of wood; provided, such walls are made solid and without cellular open spaces within them. The external bin walls shall have a covering of brick or hollow tile not less than twelve inches thick, which shall be united to the bin walls by anchors, in the construction and arrangement of which due allowance is made for the variations of shrinkage of the enclosing wall and of the wooden bin wall. If the weight of the bins is independently carried on a skeleton construction of timber, steel or iron, the first-story walls shall be of brick, not less than twenty inches thick. If the outer walls of the outside bins and their facing are not carried on a skeleton construction, then the first-story wall shall not be less than twenty-eight inches thick, or as much thicker as may be required to keep the load upon the brickwork within the limits of stress elsewhere specified in this ordinance.

The cupola or enclosure walls of elevator buildings shall be made of hollow tile not less than six inches thick; anchor the framework as above specified.

The outside openings in elevator buildings shall have protections of wire netting made of No. 14 wire, with meshes not over $\frac{1}{2}$ by $\frac{1}{2}$ inch.

All openings in the body of first story elevator buildings, and the openings in the engine and boiler houses of the same, and between these and the main building, shall have iron doors.

Sec. 148. **Thickness of Walls of Classes II and III.**—**Exception to Above.**—Buildings of Classes II and III shall conform to the following requirements:

The thickness of enclosing walls of buildings of this class shall be made in accordance with the following table, to-wit:

	Basement.	STORIES.											
		1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.
Basement and.....	12	8	....	....	....	....	....	....	....	....	....	....	....
Two-story.....	12	12	8	....	....	....	....	....	....	....	....	....	....
Three-story.....	16	12	12	8	....	....	....	....	....	....	....	....	....
Four-story.....	20	16	16	12	12	....	....	....	....	....	....	....	....
Five-story.....	20	16	16	16	12	12	....	....	....	....	....	....	....
Six-story.....	20	20	16	16	16	12	12	....	....	....	....	....	....
Seven-story.....	24	24	20	20	16	16	12	12	....	....	....	....	....
Eight-story.....	24	24	24	20	20	16	16	12	12	....	....	....	....
Nine-story.....	28	24	24	20	20	20	16	16	12	12	....	....	....
Ten-story.....	28	24	24	24	20	20	20	16	16	12	12	....	....
Eleven-story.....	28	28	24	24	24	20	20	20	16	16	12	12	....
Twelve-story.....	32	28	28	24	24	24	20	20	20	16	16	12	12

Three-story apartment houses or flats shall have the third story wall 12 inches in thickness instead of 8 inches as above. (To apply to new buildings only.)

As amended June 27, 1898.

Sec. 149. **Supports for Joists.**—If in buildings of Class II the distance between the enclosing walls is more than twenty-four feet in the clear, there shall be intermediate supports for the joists, which supports shall be either brick walls or iron or steel col-

umns and beams. If brick walls are used for this purpose they may, in all cases where the thickness of walls is given in the table as sixteen inches or more, be made four inches less in thickness than the dimensions stated in the table.

Sec. 150. Division Walls and Partitions in Apartment Houses, Boarding or Lodging Houses and Hotels.—In all apartment houses, the dividing walls or partitions between the apartments provided for each family shall be made entirely of incombustible material. In boarding houses, lodging houses, or hotels, sixty feet or less in height, there shall be for every eight rooms in any one story, dividing walls or partitions of incombustible material or of stud partitions filled the full thickness and height with mineral wool, or substance equally as good, and plastered on metal lath, separating these eight rooms from the contiguous spaces.—T. H. O. Sec. 15.

Sec. 151. Fire Stop in Hotels, Lodging Houses and Boarding Houses.—In hotels or lodging houses or boarding houses, 90 feet or less in height, there shall be a fire stop of brick, concrete or tile, between the ceiling and floor in each floor of joists for each twenty-five feet or fractional part thereof measured in the direction of the length of joists.

Sec. 152. Stairs in Class II.—Office Buildings—Meaning of.—Stairs in.—Stairs in buildings of Class II shall be adapted, in number and width, to the area, height, and to the uses to be made of the building in which they occur.

For office buildings, by which shall be understood buildings divided into apartments intended for business uses only, and in which there shall be no sleeping apartments whatever, there shall be in buildings of ordinary construction and of less ground area than 2,000 square feet, one flight of stairs not less than five feet wide, or two flights not less than three feet wide each; and for office buildings of ordinary construction and of greater ground area than 2,000 square feet, there shall be an additional flight of stairs for each additional 2,000 square feet of ground area, or for any fractional part thereof. For office buildings of slow-burning or mill construction there shall be at least one flight of stairs not less than five feet wide or two flights not less than three feet wide for the first 3,000 square feet of ground area, and an additional flight of stairs shall be required for each additional 3,000 square feet of ground area or fractional part thereof. For fireproof office buildings there will be required one flight of stairs not less than five feet wide for the first 5,000 square feet of ground area, and an additional flight for each additional 5,000 square feet of ground area or fractional part thereof.

Sec. 153. Stairs in All Other Buildings of Class II.—For all other buildings of Class II, there will be required for each building at least two flights of stairs which, for buildings of 2,000 square feet or less in ground area, shall be at least three feet wide each with an increase of six inches in width for each additional 500 square feet to the ground area of the building up to a ground area of 3,000 square feet, and after that there shall be an additional flight of stairs not less than three feet wide for each additional 2,000 square feet of floor area or fractional part thereof. In all cases where buildings of Class II are built entirely of fireproof construction, the number of stairs herein provided may be reduced by one flight from the number herein specified for non-fireproof buildings.—T. H. O. Secs. 3 to 13 inc.

Sec. 154. Rooms of Class II—When Considered Habitable.—In buildings of Class II and III no room shall be considered habitable or used as a habitation unless it has at least one window of an area equal to one-tenth of the superficial area of such room, opening into the external air. Provided, however, that no stall or compartment used as a sleeping room in a building, the walls of which stall or compartment do not extend within a distance of two and one-half feet from the ceiling thereof, shall be regarded and considered to be a room within the intent and meaning of the provisions of this ordinance, but the walls of every such stall or compartment shall be of non-combustible material.—T. H. O. 24, 25, 26, 27, 30.

As amended Jan. 19, 1903.

Sec. 155. Means of Communication with Outer Air of Buildings.—No space of less area than thirty-six square feet for each three-story building, or less area than forty-eight square feet for a four-story building, and so on, increasing ten square feet for each additional story in height, shall be considered as affording means of communication with the outer air, and such open spaces or light shafts, if covered with a skylight or roof of any kind, shall not be considered as fulfilling the terms of this ordinance. This space must be left on land owned by owner of building in question.—T. H. O. Secs. 11, 18 to 32 inc.

Sec. 156. Strength of Floors of Class I.—No building of Class I shall be built with a strength of floor construction in any part thereof less than sufficient to carry, within the limits of stress for the different materials elsewhere herein specified, a load of 100 pounds for each square foot of floor surface; and the strength of such building shall be increased above the capacity to carry 100 pounds per square foot of floor surface, if the uses to which such building or part thereof is to be applied involve greater stress.

Sec. 157. Display of Placard Indicating Strength of Floors.—It shall be the duty of the owner of every building of Class I, already constructed, or hereafter to be constructed, or of his agent, or of the occupant of the same, to affix and display conspicuously on each floor of such building, a placard stating the load per square foot of floor surface which may with safety be applied to that particular floor, or if the strength of different parts of any floor varies, then there shall be such placards for each varying part of such floor. It shall be unlawful to load any such floors or any part thereof to a greater extent than the load indicated upon such placards. It shall be the duty of occupants of buildings to maintain such placards during their occupation of the premises, and the owners of buildings, or their agents, to cause the same to be properly affixed with each change of occupation. It shall be part of the duty of architects of all buildings to calculate the figures for such placard, which are to be verified and approved by the Commissioner of Buildings before they are affixed upon the respective floors of the different buildings.

Sec. 158. Allowance for Live Load in Constructing Floors of Classes II and III. — Determining Strength of Posts and Area of Foundation of Classes II and III.—For buildings of Classes II and III, except office buildings, including frame buildings outside of the fire limits, the floor shall be designed and constructed in such manner as to be capable of bearing in all their parts, in addition to the weight of partitions and permanent fixtures and mechanisms that may be set upon the same, a live load of 40 pounds for every square foot of surface in such floors. For office buildings and for all buildings of Classes IV and V the live load above referred to shall be 100 pounds per square foot.

In determining the area of foundation for many-storied buildings in buildings of Classes II and III, allowances are to be made for the fact that the before mentioned live load is but an occasional load, which rarely occurs simultaneously upon corresponding parts of many floors, and if so, for a very brief period only.

Sec. 159. Strength of Roofs.—The roofs of all buildings of every kind and class, including frame buildings outside of fire limits, shall be designed and constructed in such manner that they will bear a load in addition to their structure and covering of at least twenty-five pounds for each square foot of horizontal surface.

Sec. 160. Ordinance—Not Considered as Requiring Alteration of Building.—Altering Building to Make Conform to Ordinance.—Excepting in cases where the immediate safety of the occupants of buildings is concerned, nothing in this ordinance shall be considered as requiring alterations in the construction or equipment of buildings existing at the time of the passage of this ordinance and at that time complying with the ordinance at that time in force. If, however, it is desired to enlarge, or in any manner materially modify the construction of any existing buildings, or to make change in its use or occupation which will transfer it from one class as recognized by this ordinance to another, then before such enlargement or structural change or modification of building is made, or before such change in its use or occupation may be made, the entire building shall be reconstructed or modified in such manner as to bring the same when enlarged or altered, or when occupied for its new and different purposes, in accordance with the provisions of this ordinance.—T. II. O. Secs. 25, 36, 50.

Sec. 161. Increasing Thickness of Walls of Altered Building.—If the walls of such building are not of sufficient thickness to comply with the requirements of this ordinance for the enlarged or modified building, then the thickness of the existing walls shall be increased by building alongside of them a new wall, which shall not, however, be less in any part thereof than 12 inches thick, and which shall be increased in thickness by four inches for at least every forty feet in the height of such wall. Such new wall must be laid in cement mortar and must be anchored to the old wall (bonding with brick or masonry will not be considered as complying with this ordinance); and if an increase in the height of the building is contemplated, the wall from the top of the old wall shall be built jointly upon the new and old walls. If solid masonry buttresses are introduced in connection with such thickening and strengthening of existing walls, the intervening wall may be reduced to eight inches in thickness, provided such buttresses are sufficient in number and in area to make the resultant structure of equal strength with the solid wall already specified.

Sec. 162. Party Walls.—The foregoing shall also apply to all cases where existing party walls are to be joined to for the erection of new buildings. But in the case of party walls which at the time of their erection were built in accordance with the terms of the building ordinance then in force, such walls, if sound and in good condition, may be used without increase of thickness for any building not higher than and of the same class as the building for which the original wall was built.

Sec. 163. Foundation of New and Old Walls.—In all cases where there is such increase of walls, a new foundation shall be built in such manner as to carry jointly both the new and old walls, and the soil under such foundations shall not be loaded beyond the limits elsewhere herein specified.

Sections 164 to 197, both inclusive, were repealed by an ordinance passed January 18, 1904, which will be found under the heads Classes 4 and 5, page 121.

Sec. 198. Movable Awning—Erection of.—All movable awnings hereafter erected shall be elevated at least eight feet at the lowest part thereto above the top of the sidewalk, and shall not project over the sidewalk to exceed three quarters of the width thereof. They shall be supported without posts, by iron brackets, or by an iron framework attached firmly to the building, so as to leave the sidewalk wholly unobstructed thereby.

Sec. 199. Fixed Awnings—Erection of.—Width and Height of.—Fixed awnings may be constructed over sidewalks as protection to the entrances of buildings, provided that such awnings are constructed of metal framework, filled with glass not less than three-fourths inch thick, and supported entirely from the structure of the building, and without posts or other obstructions upon the sidewalk.

Such awnings shall be of the width of the entrance which they protect, and shall extend over the entire width of the sidewalk in front of the same. The lowest part of such awnings shall be at least 12 feet above the sidewalk level.

Awnings projecting not over four (4) feet from building line may be ten (10) feet above the sidewalk at their lowest point.

Sec. 200. Hatch Closers, in Elevator Shafts of Class I.—Commissioner and Fire Marshal to Examine.—It shall be lawful for elevators used exclusively as freight elevators to be without enclosing walls, but in all such cases there shall be at every floor through which such freight elevator or elevators pass, automatic hatch closers or automatic doors, made in such manner that they will fully close each well hole when the temperature in such well hole exceeds 140 degrees Fahrenheit; and it shall be the duty of the owner, or his agent, of the building in which such elevator or elevators is or are maintained to keep the said hatch closers or doors at all times in good working order, and any such owner or agent failing so to do shall be fined not less than Twenty-five Dollars (\$25) nor more than Two Hundred Dollars (\$200) for each offense.

Before any doors shall be considered as fulfilling the purposes of this ordinance, they shall be examined by the Commissioner of Buildings and the Fire Marshal, and if it be found by these officials that such doors will automatically close when the temperature at or near the same exceeds 140 degrees Fahrenheit, and that also the conditions of construction and operation of such doors or hatch closers are such that there is no reasonable probability of their getting out of order, and failing to operate when required, and if there is nothing in their application or operation that is likely to cause accidents to, or interference with, the elevator service in the hatch holes which they are intended to close, then and in such case only, shall the use of such hatch closers or doors be permitted.

But such automatic hatch closers or doors shall only be permitted in cases where the building in which such freight elevator is in use shall be equipped with stairways, or stairways and passenger elevators, sufficient to afford ample means of escape from said building in case of fire for all persons employed or for all persons in said building, and in buildings not so equipped such freight elevators must be enclosed in fireproof walls, as hereinafter required.

Provided, that all freight elevators herein specified must be either enclosed in fireproof walls as hereinafter required or equipped with automatic hatch closers or doors as herein specified; and provided, further, that this section shall not apply to elevators in fireproof buildings.

Sec. 201. Elevator Well, when Enclosed—Walls of.—In all non-fireproof buildings all passenger elevators, and all freight elevators, except such as are expressly excepted by this ordinance, shall be enclosed in a wall of brick, tile or such other non-combustible material as may, from time to time, be approved by the Commissioner of Buildings as proper and suitable for the purpose; such wall to extend from the foundation to the roof of such building, and when built of brick or tile to be entirely self-sustaining; provided, that where such elevator shafts are placed within walls or partitions of fireproof material surrounding said shafts in common with stairways or in common with stairways and corridors, additional enclosures about said shafts alone shall not be required. Provided, further, however, that the provisions of this section shall not apply to any non-fireproof building which is equipped throughout on every floor and in every room thereof and in all stairways, platforms, elevator shafts, elevator hoistways and well holes with an automatic sprinkler system approved by the fire marshal.

Sec. 202. Elevator Shafts—Doors of.—In all elevator shafts which are herein required to be enclosed with fireproof walls, the openings through which ingress and egress to and from such elevators is had, shall be equipped with fireproof doors, of iron or other non-combustible material, to be approved by the Building Commissioner, which shall be made to open from the inside, except that they shall also be made to open from the outside by means of a key or other device satisfactory to the Commissioner of Buildings.

Sec. 203. Elevator Shaft—Roof of.—The roof of each passenger elevator, shaft or enclosure shall be formed by a skylight, and shall have a ventilator of at least one-twentieth of the area of the shaft. Skylights may be omitted in shafts wherein there are windows opening on streets, alleys or courts, but such windows shall be glazed with fireproof glass.

Sec. 203a. The foregoing provisions of said Sections 200, 201, 202 and 203 shall apply to buildings now existing or hereafter constructed.

Passed Jan. 25, 1904.

Sec. 203b. In every factory, workshop, or other place or structure where machinery is employed the belting, shafting, gearing, elevators and every other portion of machinery when so located as to endanger the lives and limbs of those employed therein while in the discharge of their duties shall be, as far as possible, so covered or guarded as to make them reasonably safe and to prevent injury to such employes.

Passed Feb. 24, 1904.

Sec. 204. Scaffolds — Erection of. — Floors During Building Operations. — Fine for Violation of Ordinance. — Commissioner May Revoke Building Permit — Architect Liable to Penalty.—All scaffolds erected in this city for use in the erection, repair, alteration or removal of buildings, shall be well and safely supported, and of sufficient width, and properly secured, so as to insure the safety of persons working thereon, or passing under, or by the same, to prevent the falling thereof, or of any materials that may be used, placed or deposited thereon. It shall be the duty of all owners, contractors and builders, and all persons who shall have the supervision or control of the construction or remodeling of any building more than thirty feet high, to put in and lay upon the upper side of the joists or girders of each story in any building as soon as the joists or girders are laid, a good and substantial temporary or permanent floor for the protection of employes and all persons engaged in or upon the construction of said building, wherein no unprotected opening shall be left; and it shall be unlawful to place or put up the joists or girders of another story until each lower floor is thus laid. And it shall be the duty of all owners, contractors, builders or persons having the control or supervision of all buildings which shall be more than thirty feet high to see that all stairways, elevator openings, flues and all other openings in the floors shall be covered or properly protected.

Any person or persons violating the provisions of this ordinance shall be each fined in a sum not less than one hundred dollars nor more than two hundred dollars per day; and any permit granted for the construction of said building by the authorities of the City of Chicago may be revoked in the discretion of the Commissioner of Buildings of the City of Chicago. Any architect having charge of such building, who shall permit it to be constructed in violation of this ordinance, shall be liable to the penalties provided and imposed by this ordinance.

Sec. 205. Walls—Erection of—Walls and Skeleton Framework Securely Braced — Foundations Protected.—In the erection of buildings of masonry construction, no wall shall be carried up at any time more than two stories above another wall of the same building. The walls and skeleton framework of all buildings must be kept securely braced and otherwise protected against the effects of the weather during all building operations. All foundations must be protected against the effects of frost, and frozen cement mortar shall not be used in connection with building operations.

Sec. 206. Signs on Buildings.—All signs placed on any building above the level of the second story of the same shall be made of incombustible material. Wooden signs shall not be made of greater width than two feet.

(1.) All signs or billboards other than those painted or erected upon any building, shall be limited in their superficial area to one hundred (100) square feet, and shall be constructed of sheet or galvanized iron or some equally incombustible material, and such signs or billboards shall not be located nearer than twenty-five (25) feet back of the front line of the lot whereon the same is to be erected; provided, that signs not to exceed twelve (12) square feet each may be made of wood, but such signs shall in all other respects comply with above section.

(2.) No such sign or billboard shall be constructed at a greater height than ten (10) feet above the level of adjoining streets, and the base of the sign or billboard shall be in all cases at least three (3) feet above the level of the adjoining streets; in case the grade of adjoining streets has not been established, no sign or billboard shall be constructed at greater height than ten (10) feet above the surface of the ground.

(3.) No such sign or billboard shall be erected within five (5) feet of any other sign or billboard, and each such sign or billboard shall have independent support.

(4.) No such sign or billboard shall be erected upon or along any boulevard or pleasure driveway or in any street where three-quarters ($\frac{3}{4}$) of the buildings in such street are devoted to residence purposes only, unless the person or persons desiring to erect such sign or billboard shall first have secured the consent in writing of three-quarters ($\frac{3}{4}$) of the residence and property owners on both sides of the street in the block where it is desired to erect such sign or bill board.

(5.) All owners of signs or billboards erected before the passage of this ordinance, which signs or billboards have a superficial area exceeding one hundred (100) square feet, or which are of greater height than ten (10) feet above the surface of the ground (other than such signs or billboards as are painted or erected upon buildings), shall pay an annual license on the first day of July of each year at the rate of fifty (50) cents per square foot; and in case of failure to pay such annual license within thirty (30) days of July first of each year, such signs or billboards shall be torn down by the Fire Department under the direction of the Commissioner of Buildings.

(6.) Any person, firm, company or corporation who violates, disobeys, omits, neglects or refuses to comply with, or who resists or opposes the execution of any of the provisions of this ordinance, shall be subject to a fine of not less than five (\$5.00) dollars per day, nor more than fifty (\$50.00) dollars per day; and every such person, firm, company or corporation shall be deemed guilty of a separate offense for every day such violation, disobedience, omission, neglect or refusal shall continue, and shall be subject to the penalty imposed by this section for each and every such separate offense, and any builder or contractor who shall construct any sign or billboard on vacant property, in violation of any of the provisions of this ordinance, shall be subject to a like fine.

As amended July 9, 1900.

Sec. 206a. Restrictions as to Locations for Signs and Bill Boards.

(1.) All sign-boards and bill-boards now or hereafter erected on any residence street within two hundred feet of any park, park boulevard or driveway, except sign-boards not exceeding three feet square used for advertising the sale or renting of the property on which they are located, and all signs on buildings on any residence street within said two hundred feet, except signs advertising the business within, are hereby declared to be public nuisances, and any such first described sign-boards or bill-boards now existing shall be removed by the owners thereof within thirty days after the passage of this ordinance, or upon failure thereof, the same shall be torn down and destroyed under the direction of the Commissioner of Buildings.

(2.) Any person violating this ordinance shall be fined not exceeding one hundred (\$100.00) dollars for the first offense, and for each subsequent offense shall be fined in a like amount and imprisoned not exceeding three months.

Passed Jan. 28, 1901.

Sec. 207. Fences—Height of.—No wood fence shall be constructed of greater height than eight feet above the sidewalk grade, or eight feet above the surface of the ground, where no grade is established.

Sec. 208. Storage of Lumber.—No lumber shall be piled for the purpose of storage seasoning or drying the same, within fifty feet of any planing mill or woodworking manufactory, nor within 100 feet of any private residence, unless the same has been erected since the establishment of such yard.

Sec. 208a. Storage of Second-hand Lumber, Junk, etc.

(1.) That it shall be unlawful to store any second-hand lumber, old iron or junk on any premises fronting on any street on which two-thirds of the buildings fronting on both sides of such street between adjoining cross streets in the block in which the proposed storage is to be made are used for private residences, except upon petition signed by the owners of a majority of the frontage on both sides of such street within three hundred (300) feet of the premises upon which said storage is proposed.

Passed June 23, 1902.

Sec. 209. Classes I, II, III and IV—Fire Escapes and Standpipes On.—Class V—Fire Escape and Standpipe On.—All buildings, Classes I, II, III IV, of four or more stories in height, in the City of Chicago, shall be provided and equipped with one or more metallic standpipes and ladders combined, with cast-iron, wrought-iron or steel balconies, with suitable railings at each floor, and firmly secured to the outer walls, and in such locations and numbers as shall be satisfactory to the Commissioner of Buildings, the Fire Marshal and the Fire-Escape Inspector.

All buildings of Class V, with accommodations for 1,000 or more persons, shall have at least one three-inch iron standpipe and metallic ladder combined in the street or alley, on the outside of the building, from ground to roof, with hose attachments, close to a window or door at each floor or gallery.

All such fire escapes shall be put up and completed to conform to the buildings for which they are respectively intended and shall be inspected after completion, and if found in a perfectly safe and satisfactory condition, a certificate shall be issued by the Commissioner of Buildings to that effect upon payment of \$1.—T. H. O. Sec. 3.

As to Classes 4 and 5, see ordinance governing same, page 121.

Sec. 210. Anchors. — Balconies. — Ladders. — Standpipe. — Siamese. — Anchors for the Top of Standpipe. — Painting.—All single and double fire escapes, with ladders, hereafter erected, shall be in strict accordance with the following specifications:

There shall be no less than three 1-inch square or 1-inch diameter round wrought-iron anchors to every six-foot balcony, and six for a twelve-foot balcony. Said anchors must pass through the wall of building and bolt on the inside with a $\frac{3}{4}$ x 2-inch nut and $3\frac{1}{2}$ -

inch cast-iron washer back of nut, where the wall is not over twenty inches thick; but where wall is over twenty inches thick, anchors shall be inserted at least eight inches into the wall on an angle of thirty-five degrees.

The brace of anchors must at least be twenty inches spread, and pass into the wall four inches at bottom. No other anchors allowed without a special permit from the Commissioner of Buildings.

All balconies hereinafter erected must be either heavy cast-iron, iceproof, capable of sustaining a weight of 500 pounds to the square foot, or a steel balcony, as hereinafter described, capable of sustaining the same weight per square foot. The balcony frame will be made of not less than $1\frac{1}{2}$ x 3 angle iron, securely riveted together, with cross-bars every two feet, said bars to be punched one-half inch square every two inch, center, and $\frac{1}{2}$ -inch square iron forced through the same, leaving a manhole of not less than 24 x 24 inches. The cross-bars to be securely riveted to the angle-iron frame. The cross-bars for a balcony twenty-eight inches wide to be $1\frac{1}{2}$ x $\frac{3}{8}$ inch iron. Balcony frames over twenty-eight inches wide will be made of not less than 2 x $\frac{3}{8}$ -inch iron, to conform with the increased dimensions of iron in cross-bars; for thirty-inch balcony, 2 x $\frac{3}{8}$ -inch; for thirty-six inch balcony or over, $2\frac{1}{2}$ x $\frac{3}{8}$ -inch. All balconies over this width must have a 2-inch "T" iron through the center of balcony for the bars to rest upon. Said balconies to have a substantial cast or wrought-iron post every three feet, bolted to the balcony. No balcony will have less than two guard rails, same to be of wrought-iron, or new pipe not less than three-fourths inches in diameter, and the ends to be anchored in the wall of building not less than ten inches on an angle of thirty-five degrees.

The ladder, where used in combination with the standpipe, must be bolted to said stand-pipe with short-topped bolts every four feet, and bolted to the balconies. Rungs of ladder to be $\frac{1}{2}$ -inch square iron, with the corners upward, so as to give a safe footing. Every other rung to be riveted and to be 14-inch centers. Where ladder is put up without a standpipe, the side guards must be 2 by $\frac{3}{8}$ -inch flat iron or $1\frac{1}{4}$ -inch pipe. All ladders must be 17 inches or more between pipes. No secondhand pipe will be allowed to be used and will be condemned if found in this construction by the inspector.

The standpipe will be of the best 3-inch wrought iron, $7\frac{1}{2}$ pounds to the foot, and a $2\frac{1}{2}$ -inch brass hose valve, of the city standard thread, will be attached to the standpipe at every outlet at each floor and on the roof. Inside of all buildings over 100 feet in height, there shall be one 4-inch standpipe, extending from pump to roof, also connection on first floor with two-way siamese connection for Fire Department and check valve against pump; two hose connections on each floor and roof, with Fire Department thread and enough hose attached to reach any point of the floor.

There will be a two-way automatic siamese at the bottom of the standpipe, so that two steam fire engines can be attached to it without interfering with each other. Said siamese must be within easy reaching distance from the sidewalk and to be securely anchored to the wall of the building.

All the anchors for the top of standpipe and ladders must pass through the wall and bolt on the inside of same.

All work must be painted with two coats of the best mineral paint, and all holes must be filled up with the best cement.

(1.) Every building, lodging house and hotel in the City of Chicago, required by law to be equipped with metallic stand-pipes and wrought iron or steel balconies, or other fire escape devices, shall have displayed in conspicuous places, on each floor of such building, lodging house and hotel, notices, sufficient in number and in plainly legible type at least three-fourths of an inch in height, indicating and showing the location of such metallic ladders, balconies and fire escapes and the easiest way to reach them.

(2.) Any owner or agent of any such building, lodging house or hotel who violates, disobeys, omits or neglects to comply with the terms of this ordinance shall be subject to a fine of not less than five (\$5.00) nor more than fifty (\$50.00) dollars, and every such owner or agent shall be deemed guilty of a separate offense for every day such violation, disobedience, omission or neglect shall continue, and shall be subject to the penalty imposed hereby for each and every such separate offense.

That no such fire escape shall be constructed except upon a permit therefor, issued by the said Commissioner of Buildings upon the payment by applicant therefor to the City Collector of a permit fee of \$2 as amended Jan. 14, 1901.

Sec. 210a. Devices for Shutting off Gas or Electricity outside of Building.—

(1.) That every building within the corporate limits of the City of Chicago in which gas or electricity is used for illuminating, heating, or other purposes, shall be equipped with a device or devices which will enable firemen to shut off the supply of gas or current of electricity to any such building from the outside thereof; such device or devices to be placed at such a point or at such points on the outside of any such building as may be designated by the Commissioner of Buildings of the City of Chicago, and to be of such design and construction as to enable said device or devices to perform with reasonable certainty and safety the work required to be done thereby.

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Any device or devices installed for the purpose of carrying out the provisions of this ordinance shall first be approved by the Commissioner of Buildings of the City of Chicago, and after the installation thereof the control of any such device or devices so installed in or upon any building under the provisions of this ordinance shall be in the Fire Department of the City of Chicago:

Provided, however, that buildings used exclusively for residence purposes and out-buildings, sheds, or barns attached or appurtenant to buildings used exclusively for residence purposes shall be exempted from the provisions of this ordinance.

(2.) On and after the first day of October, A. D., 1901, any owner, agent, or person having control or charge of any building coming within the provisions of this ordinance, who shall have neglected, failed, or refused to equip any such building with a device or devices such as are described in Section 1 hereof shall be fined not less than fifty (\$50.00) dollars nor more than one hundred (\$100.00) dollars; and each day which shall elapse from and after the first day of October, A. D. 1901, before the equipment of any such building with a device or devices as herein required, shall be deemed a separate and distinct offense.

(3.) Any person or persons who shall disturb, meddle or tamper with any device or devices installed under the provisions of this ordinance upon any building or buildings, without authority from the Fire Marshall of the City of Chicago, shall, upon conviction thereof, be fined not less than ten (\$10.00) dollars nor more than one hundred (\$100.00) dollars for each offense.

Passed May 13, 1901.

Sec. 211. Location of Buildings for Storage of Petroleum, Etc.—Walls of—Floors of—Roofs of.—Buildings designed for the storage of petroleum or articles of like nature shall not be less than 100 feet from any other building, and be constructed as follows, to-wit:

Their walls shall not be less than sixteen inches thick, nor more than sixteen feet high; their floors shall be made of fireproof paving or concrete, upon the ground, which shall be at least five feet below the street grade; their roofs shall be of metal, to have fire walls eighteen inches high all around, not less than twelve inches thick; and have copings of incombustible material, and subject to the approval of the Fire Marshal of Chicago.

Sec. 212. Storage of Petroleum, Gasoline, Etc., Within Limits of City.—It shall be unlawful for any person, persons or corporation to store or keep for sale within the corporate limits of the City of Chicago, except in buildings constructed as provided for in the last preceding section, any crude petroleum, gasoline, naphtha, benzine, camphene, spirit gas, burning fluid or spirits of turpentine, exceeding a quantity of five barrels of fifty gallons each; and it shall be unlawful to keep for sale or on storage any refined carbon, oil, kerosene or other products, for illuminating purpose, of coal, rock or earth oils, excepting such refined oils as will stand a fire test of 150 degrees Fahrenheit, and according to the method and direction of John Taglibue; and it shall not be lawful to keep any quantity of said articles exceeding one barrel of fifty gallons in any part of a building, excepting a cellar, the floor of which shall be five feet below the grade of the adjacent streets; and no crude petroleum, gasoline, naphtha, benzine, carbon oil, camphene, spirit gas, burning fluid or spirits of turpentine shall be kept or stored in front of any building, or on any street, alley, wharf, lot or sidewalk, for a longer time than is sufficient to receive in store or in delivering the same, provided such time shall not exceed six hours.

Sec. 212a. Tank for Water.—It shall be unlawful for any person to construct, maintain, or to allow or permit to remain, in or upon the roof of any building in the City of Chicago, any water tank of a larger capacity than four hundred (400) gallons, unless the said tank shall rest upon a good and sufficient foundation of solid brick or stone masonry, or upon iron girders which rest upon a good and sufficient foundation of solid brick or stone masonry, or upon iron or steel construction; provided, however, that no water tank of a capacity exceeding four hundred (400) gallons shall be constructed in or upon any building without first obtaining therefor a permit from the Commissioner of Buildings and paying therefor a fee of two (\$2.00) dollars.

As amended May 13, 1901.

Sec. 213. Buildings in Public Parks.—Buildings in public parks shall be subject to the provisions of this ordinance.

Sec. 214. Fire Limits of City.—Walls—Structures and Buildings Altered to Conform to Ordinance.—The fire limits of the City of Chicago shall be as defined by existing ordinances.

No wall, structure, building or part thereof will hereafter be built, constructed, altered or repaired within the fire limits of the City of Chicago except in conformity with the provisions of this ordinance. No building already erected or hereafter to be built within said fire limits shall be raised, altered or built upon in such manner that, were said building wholly rebuilt or constructed after the passage of this ordinance, it would be in violation of any of its provisions.—T. H. O. Sec. 3.

Sec. 215. Expense of Altering Buildings by the City Recoverable from Owner.—Whenever, in the opinion of the Commissioner of Buildings, it shall be necessary to tear down, alter, repair or rebuild any building or portion of any building which is dangerous, defective or unsafe, or which is reported to the said Commissioner by the Commissioner of Health to be unfit for human occupancy, or which has been built in violation of any of the provisions of this ordinance, or of any ordinance regulating the construction of buildings hereafter to be passed, he shall cause such building or such portion thereof to be torn down, altered, repaired or rebuilt, or such work to be done thereon as he may deem necessary to render said building, or said portion thereof, safe, and the expense thereof shall be recoverable of the owner or owners of said building, in an action of assumpsit, with such other process as may be necessary to insure the collection of said expense.

Sec. 216. Fines for Violation of Ordinance.—Any person, firm, company or corporation who violates, disobeys, omits, neglects, or refuses to comply with, or who resists or opposes the execution of any of the provisions of this ordinance, shall be subject to a fine of not less than \$25, nor more than \$200; and every such person, firm, company or corporation shall be deemed guilty of a separate offense for every day such violation, disobedience, omission, neglect or refusal shall continue, and shall be subject to the penalty imposed by this section for each and every separate offense; and any builder or contractor who shall construct any building in violation of any of the provisions of this ordinance, and any architect designing or having charge of such building who shall permit it to be so constructed, shall be liable to the penalties provided and imposed by this section.—T. H. O. Sec. 56.

Sec. 217. Municipal Code—Sections of Repealed.—That sections of the Municipal Code of Chicago of 1881, numbered as follows: 612 to 620, both inclusive; 623 to 651, both inclusive; Sections 990 to 1140, both inclusive, except Section 1109; also an ordinance relating to building permits passed October 3, 1887, and all ordinances and parts of ordinances in conflict with the provisions of this ordinance, are hereby repealed.

Sec. 218. Ordinance in Force After Passage.—This Ordinance shall be in force from and after its passage.

Sec. 219. At the expiration of thirty days after the printing and publication of said building ordinances, each and every person, agent, firm, company or corporation engaged within the limits of City of Chicago in the construction or repairing of the whole or any part of buildings and appurtenances, shall be and he or it is hereby required to obtain a license from the City of Chicago, which shall permit him or it to engage thereafter in the business of contracting for the erection of buildings and appurtenances or parts thereof.

Every application for such license shall be made on printed blanks furnished by the city, and shall set forth the name and residence or place of business of the applicant, and the nature of the contracts which he or it desires to engage in for a period of one year thereafter, and shall be accompanied by a fee of \$2.

The city shall thereupon issue a license in due form, permitting the applicant to engage in the business of contracting for the erection of buildings and appurtenances, or parts thereof, in the City of Chicago, for one year from the date of such license, which date shall be the first day of May in the year in which such license is applied for, and no license shall be granted for any period less than a year, and all licenses shall run from the first day of May in each year until the 30th day of April in the succeeding year. The applicant shall also receive, free of charge, with his license, a copy of said compilation of the building ordinances and all building ordinances which may be passed after the publication of said compilation.

Nothing herein contained shall be construed as to make any change in the proper fees as now prescribed in the city ordinances to be paid to the City of Chicago for every 25 feet of street frontage so used.

Any person, agent, firm, company or corporation who shall, after the date fixed, as aforesaid, for the issuance of licenses, engage in the business of building in the City of Chicago, under contracts for the whole or any part of buildings and appurtenances, without first having obtained a license therefor, as aforesaid, shall be deemed guilty of a misdemeanor for each day's violation of the provisions of this ordinance, and shall be subject to a fine for each offense of not less than \$25 nor more than \$100.

NOTE.—Sec. 49 was further amended March 29, 1904, by including "planing mills."

Officials of the Law and Building Departments are now at work revising and reconstructing the Building Ordinance subject to the approval of the City Council. Within the year an entire new ordinance will be ready for the public, and until this appears the several sections may be considered the orders of the Building Department unless severally changed in the meantime by vote of the City Council.

TENEMENT HOUSE ORDINANCE.

ORDINANCE AS PASSED DECEMBER 17, AND AMENDED DECEMBER 22, 1902,

MARCH 2, 1903, AND MARCH 23, 1904.

To improve the construction, sanitation, convenience and safety of tenement houses.

Section 1. As used in this ordinance: (1) **"Tenement House"** is any house or building or portion thereof which is (a) intended or designed to be occupied or (b) leased for occupation, or (c) actually occupied as a home or residence of two or more families living in separate apartments, and includes all apartment houses, flat buildings, residential hotels, etc.

"New Tenement House" includes (a) every tenement house hereafter erected for which ground has not been broken (under a building permit heretofore issued) prior to the day of the taking effect of this ordinance, and includes every such new tenement house as shall be increased or diminished in size or as shall be otherwise altered after its erection, and (b) every building now or hereafter in existence not now used as a tenement house, but hereafter converted or altered to such use;

(2) **"Apartment"** is a room or suite of two or more rooms occupied or leased for occupation or intended or designed to be occupied as a family domicile;

(3) **"Yard"** is an open, unoccupied space on the same lot with a tenement house, separating every part of every building on the lot from the rear line of the lot;

(4) **"Court"** is an open, unoccupied space, other than a yard, on the same lot with a tenement house; a court entirely surrounded by a tenement house is an "inner court;" a court bounded on one side and both ends by a tenement house and on the remaining side by a lot line is a "lot line court;" a court extending to a street, alley or yard is an "outer court."

(5) **"Shaft"** includes exterior and interior shafts, whether for air, light, elevator, dumb waiter or any other purpose; a "vent shaft" is one used solely to ventilate or light a water closet compartment, bath room, or pantry;

(6) **"Public Hall"** is a hall, corridor or passageway not within an apartment;

(7) **"Stair Hall"** includes the stairs, stair landings, and those portions of the public halls through which it is necessary to pass in getting from the entrance floor to the top story;

(8) **"Basement"** is a story partly, but not more than one-half—"Cellar" is a story more than one-half—below the level of the street grade nearest the building; where the grade of a street adjacent to a tenement house varies the mean or average grade of such street opposite the lot containing the tenement house shall be regarded as the grade of such street within the meaning of this ordinance.

(9) **"Story"** is that portion of a building between the top of any floor beams and the top of the floor beams next above;

(10) **"Shall"** is always mandatory and not directory, and the mandate "shall" (positively or negatively, as the case may require) applies to and governs any alterations in any tenement house, or in any courts or yards connected therewith, and shall equally apply to and govern the conditions resulting from any such alterations, as well as the original conditions of such house, courts and yards, so long as the building remains a tenement house.

(11) **"Solid Masonry."** A good quality of brick, laid in lime mortar of strength and character equal to the requirements of the building ordinances of the City of Chicago for brick walls, shall be taken as the standard of strength and stability for "solid masonry," but any other materials of equal strength and stability to the above standard may be substituted for brick.

Sec. 2. **More than Five Stories Fire-proof—Four and Five Stories may be Slow-burning.**— Every new tenement house more than five (5) stories and basement high shall be of fire-proof construction (according to the definition of "fire-proof construction" contained in the Building Code of the City of Chicago); every new tenement house more than three (3) stories and basement high, but not more than five (5) stories and

basement high, shall be of slow-burning construction (according to the definition of "slow-burning construction" contained in the Building Code of the City of Chicago) with the cellar and basement construction, including the floor construction of the first story above the cellar or basement, fire-proof.

Sec. 3. Fire Escapes in Buildings over Three Stories—Access to—Metal Stairways, Courts, &c.—Every non-fire-proof tenement house more than three (3) stories and basement high shall be provided with a fire escape or fire escapes, such as are required by the statutes of Illinois and the ordinances of the City of Chicago. In every case each separate apartment shall have direct access to at least one (1) such fire escape unless such apartment shall have direct access (without passing through any other apartment) to at least two (2) separate flights of stairs leading to the ground, one of which is placed in the front and one in the rear of such building, one of which may be placed outside of the building; but where such separate apartment shall not have access to two (2) such flights of stairs, then there shall be a metal stairway between the balconies of every such fire escape, securely fastened to the walls of the building, not less than two (2) feet wide, with a proper hand-rail, instead of the usual vertical ladder. Every court in which there shall be a fire escape shall have direct and unobstructed access along the surface of the ground to a street, alley or yard, opening into the alley or street, without entering into or passing through or over any building, unless by a four (4) foot wide fire-proof passage on the court or ground level.

As amended March 23, 1904.

Sec. 4. Fire Escapes to be Painted.—Every new fire escape shall be painted with two (2) coats of durable paint, one put on in the shop and the other at once upon the erection of such fire escape.

Sec. 5. Bulkheads and Scuttles—Stairs to.—Every tenement house shall have in the roof a bulkhead or scuttle, fire-proof or covered with fire-proof materials, with stairs or ladder leading thereto; no such roof opening shall be less than two (2) feet by three (3) feet. No scuttle or bulkhead door shall have upon it any lock, but may be fastened on the inside by movable bolts or hooks.

Sec. 6. Stairs and Halls In Case of Alterations. Requirements.—Every new tenement house shall have at least two (2) flights of stairs, which shall extend from the entrance floor to the top story. Such stairs and the public halls in every new tenement house shall each be at least three (3) feet wide in the clear, and every apartment shall be directly accessible from an entrance hall by means of at least one such flight of stairs. If any existing tenement house be so altered as to increase the number of apartments therein, or if such building be increased in height, or if the halls and stairs therein be damaged by fire or otherwise to an extent greater than one-half the value thereof, the entrance, stair halls, entrance halls and other public halls of the whole building shall be made to conform to the requirements of this ordinance as to new tenement houses.

Sec. 7. Railings and Guards.—In every tenement house all stairways shall be provided with sufficient railings and guards.

Sec. 8. Stairs in Non-Fire-proof Buildings, 80 to 120 Rooms.—Every new non-fire-proof tenement house containing over eighty (80) rooms, exclusive of bath rooms, shall have one additional flight of stairs (over and above the flights hereinbefore provided for) for every additional eighty (80) rooms, exclusive of bath rooms, or fraction thereof; but if such building contains not more than one hundred and twenty (120) rooms, exclusive of bath rooms, at the owner's option, in lieu of an additional stairway, the stairs and public halls throughout the entire building shall be at least one-half wider than is provided in Sections 6 and 13 of this ordinance.

Sec. 9. Stairs in Fire-proof Buildings, 120 Rooms and Upward.—Every new fire-proof tenement house containing over one hundred and twenty (120) rooms, exclusive of bath rooms shall have one additional flight of stairs (over and above the flights hereinbefore provided for) for every additional one hundred and twenty (120) rooms or fraction thereof; but if such building contains not more than one hundred and eighty (180) rooms, exclusive of bath rooms, at the owner's option, in lieu of an additional stairway, the stairs and public halls throughout the entire building shall be made at least one-half wider than is provided in Sections 6 and 13 of this ordinance.

Sec. 10. Entrance to Stairs—Treads and Risers.—Every flight of stairs required in a tenement house shall have an entrance on the entrance floor from a street or alley, or from a yard or court which opens into a street or alley. All stairs, except rear stairs, in new tenement houses, shall have risers not more than seven and three-quarter (7¾) inches high and treads not less than nine and one-half (9½) inches deep, exclusive of nosings, except in winding stairs, where all treads at a point eighteen (18) inches from the strings on the well side shall be at least nine and one-half (9½) inches wide, exclusive of nosings.

Sec. 11. Stairs and Stair Halls—Over Three Stories—Fire-proof Glass.—The stairs and stair halls in all new tenement houses more than three (3) stories and basement high shall be constructed of fire-proof material throughout, except that the treads of stairs (not less than one and three-fourths ($1\frac{3}{4}$) inches thick) and all handrails may be of hard wood. All windows in stair halls opening on inner courts or shafts shall be of good quality fire-proof glass.

Sec. 12. Stair Halls Enclosed in Masonry—Requirements.—In every new non-fire-proof tenement house all stair halls shall be inclosed on all sides with walls of solid masonry. All glass in such stair halls shall be good quality fire-proof glass, except where same opens into a street, alley, outer court or yard. There shall be no movable transoms or sash openings from any such stair hall to any other part of the building. This section shall not apply to tenement houses which are not more than three (3) stories and basement high with only one apartment on each floor.

Sec. 13. Entrance Halls—Enclosed in Masonry—Exceptions—Ceiling Incombustible.—Every main entrance hall in a new tenement house shall be at least three (3) feet six (6) inches wide in the clear from the entrance up to and including the stair inclosure and beyond this point at least three (3) feet wide in the clear. In every new non-fire-proof tenement house, except where there is only one apartment on each floor, such entrance hall shall be inclosed with solid masonry walls and with ceiling of incombustible materials, and shall comply with all the conditions of the preceding sections of this ordinance as to the construction of stair halls. If such entrance main hall is the only entrance to more than one flight of stairs, the several portions of such main entrance hall which separate the entrance of the building from the several flights of stairs, respectively, shall be increased, respectively, at least one foot in width for each additional flight of stairs.

Sec. 14. Frame Buildings Not to be Enlarged.—No wooden frame tenement house within the fire limits shall be enlarged either by adding to its height or to its superficial area.

Sec. 15. Bay Windows—Vent Shafts—Apartments Divided by Masonry.—Iron Beams—Walls on, to Extend to Roof.—All bay windows and all shafts and courts in new tenement houses shall have their walls of brick or other fire-proof construction throughout. All openings in vent shafts, as well as in shafts for light or ventilation, shall either have fire-proof closing doors or else shall be glazed with fire-proof glass; provided, however, that the above provisions of this section shall not apply to enclosure about elevators or in a well hole of stairs where the stairs themselves are enclosed in brick or stone walls and are constructed entirely of fire-proof materials. There shall be a wall of solid masonry of the same thickness as required for outside walls in buildings of this character, extending from the ground to the roof between each set of apartments; provided, however, that the wall between apartments above the first story extending from a main stair hall to the outer wall of the building may jog or set over to some point toward the center of the building to provide or allow for an even distribution of space of the rooms adjacent to the same; provided, however, that the said wall above the first story, if supported on iron or steel beams which must extend from the brick wall surrounding the main stair hall to the outer wall of the building at each succeeding story then the said brick wall so supported on iron or steel beams shall not of necessity be over eight (8) inches in thickness, but all brick walls between apartments which extend from the ground to the roof and above the first story of an apartment building, not supported as above described in this section, shall be of the thickness prescribed in the existing ordinances of the City of Chicago for buildings of this class.

Sec. 16. Space Occupied on Lot—Plat to Accompany Application for Permit—Corner Lots Defined—Frontages—Triangular Lots.—No new tenement house alone or with other buildings now or hereafter erected shall occupy above the first story more than eighty-five (85) per centum of the area of a corner lot or more than ninety (90) per centum if a corner lot is bounded on three (3) sides by streets or alleys, or more than seventy-five (75) per centum of the area of any other lot; provided that the space occupied by fire escapes, constructed and erected according to law, and not more than four (4) feet wide, shall be deemed unoccupied. At the time of applying for permit the applicant shall submit a plat of the lot showing the dimensions of the same and the position to be occupied by the proposed building, and the position of any other building or buildings that may be on the lot. The measurements shall in all cases be taken at the top of the first story and shall not include any portion of any street or alley. By "corner lot" is meant a lot situated at the junction of two (2) streets or of a street and public alley not less than sixteen (16) feet in width. And any portion of the width of such a lot distant more than fifty (50) feet from such junction shall not be regarded as part of a corner lot, but shall be subject to the provisions of this ordinance respecting other than corner lots. Where,

in corner lots, the two frontages are of unequal length the lesser street frontage shall be taken as the width of the lot. Street frontage alone and not alley frontage shall be considered in determining such lesser frontage. No existing tenement house shall hereafter be enlarged or its lot be diminished or other buildings be placed on its lot so that after such change a larger proportion of any corner lot or other lot upon which it is situated is covered by buildings than the aforesaid proportions respectively; provided, however, that in case of a lot triangular or irregular in shape, bounded on two or more sides by a street and having a number of lineal feet street frontage exceeding one-twentieth (1-20) of the number of square feet in the area of said lot, it shall not be necessary to comply with the conditions of this section as to percentage of lot to be covered; and provided further that there shall be no violation of Section 20 of this ordinance in the erection of any tenement house.

Sec. 17. Height, How Measured.—The height of no new tenement house shall, by more than one-half, exceed the platted width of the widest street upon which it abuts, and no existing tenement house shall be increased beyond such height. Such height shall be the perpendicular distance from the street grade nearest the house to the highest point of the roof (not including as part of the roof any cornice or bulkhead less than eight (8) feet high, or any elevator inclosure less than sixteen (16) feet high). Where such street grade varies, the mean or average grade thereof opposite such house shall be the datum from which such height shall be measured.

Sec. 18. Alley or Yard in Rear—Yards. Requirements, &c.—Distances Between Buildings on Same Lot.—At the rear of every lot containing a new tenement house (unless the rear of said lot abuts upon a public alley at least ten (10) feet wide), there shall be a yard open and unobstructed from the earth to the sky, except by fire escapes constructed and erected according to law and not more than four (4) feet wide; every part of such yard shall be directly accessible from every other part thereof. Such yard shall, on corner lots (as above defined), have an area of at least eight (8) per centum of the superficial area of the lot and shall on other lots have an area of at least ten (10) per centum of the superficial area of the lot. Every such yard shall be increased one (1) per centum of the superficial area of the lot for every story above three (3) stories in the height of the tenement house situate thereon, and in no case shall such yard separate any building on such lot by less than ten (10) feet from the rear line of the lot at the nearest point of approach of such building to such rear line. And no existing tenement house shall (unless the rear of the lot upon which it stands abuts upon a public alley at least ten (10) feet wide) hereafter be enlarged or its lot be diminished so that any building on such lot shall at any point approach nearer than ten (10) feet to the rear line of the lot (if a corner lot) or nearer than ten feet to the rear line of the lot (if not a corner lot.) Where a tenement house, now or hereafter erected, stands upon a lot, other than a corner lot, no other building shall hereafter be placed upon the front or rear of that lot, unless the minimum distance between such buildings be at least ten (10) feet, if neither building exceeds the height of one story; or fifteen (15) feet if either building exceeds the height of one (1) story, but not the height of two (2) stories; and so on, five (5) additional feet to be added to such minimum distance of ten (10) feet for every story more than one in the height of the highest building on such lot.

Sec. 19. Courts—Limitations—Porches in.—Every court of every new tenement house shall be open and unobstructed at every point thereof from the bottom thereof to the sky, save by fire escapes or stairs or landings constructed and erected according to law and projecting not more than four (4) feet into courts, which courts shall communicate directly, without obstruction, into a street, alley or yard. Where porches are constructed in courts the amount of area of unobstructed space in such court shall be exclusive of space occupied by stairs and porches. No rear porch shall be constructed which is more than eight feet in width.

Sec. 20. Windows—In Habitable Rooms—In Bath Rooms—In Shafts, &c.—In every new tenement house every habitable room, excepting water closet compartments and bath rooms, shall have at least one window opening directly upon a street, alley, yard or court. The total area of the windows opening from any such room (other than water closet compartments and bath rooms) upon a street, alley, yard or court shall be at least one-tenth of the floor area of that room, and the top of at least one window shall be not less than seven feet above the floor and the upper half of that window shall be made so as to open its full width. No window in any such room or hall (other than pantries, water closet compartments and bath rooms) shall have less than ten square feet glass area, and in no such water closet compartment or bath room shall the total window area be less than three (3) square feet glass area, or the width of any window less than one (1) foot; and when any window ventilating any water closet compartment or bath room in any new tenement house opens into a vent shaft, no window from any room other than a water closet compartment, bath room and pantry, shall open into such vent shaft.

Sec. 21. Courts—Inner—Sizes of—Lot Line Courts.—The “inner courts” of all new tenement houses defined in Section 1, Paragraph 4, shall have areas and minimum widths in all parts not less than the widths and areas as follows:

Building.	Square Feet.	Least Width.
2 stories	100	6 ft.
3 stories	120	7 ft.
4 stories	160	8 ft.
5 stories	250	12 ft.
6 stories	400	16 ft.
7 stories	625	20 ft.
8 stories	840	24 ft.

“Lot line courts” shall have areas and minimum widths in all parts not less than one-half of those specified in the above table of “inner courts.”

Sec. 22. Courts—Outer—Sizes of—Width Increased.—The “outer courts” of all tenement houses defined in Section 1, Paragraph 4, shall have not less than the following widths for their minimum in all parts:

Building.	Least Width.
2 stories	3 ft.
3 stories	3 ft. 6 in.
4 stories	4 ft.
5 stories	6 ft.
6 stories	8 ft.
7 stories	10 ft.
8 stories	12 ft.

If the “outer court” has windows on each side of the same, the least width given in the above table for “outer courts” shall be doubled for the minimum widths, and where the depth of a court shall exceed three (3) rooms the court shall be made at least one (1) foot wider for each additional room over two (2) rooms from outer or lot line end of court.

Sec. 23. Intakes or Ducts—Sizes of—Grilles or Transoms.—Every inner court (not part of an outer court according to the provisions of sub-head 4 of Section 1 of this ordinance) adjacent to a new tenement house more than three (3) stories and basement high, shall be provided with one or more horizontal intakes or ducts at the bottom. Such intakes or ducts shall have a sectional area of not less than three (3) per centum of the required area of said court, measured at the bottom thereof, and shall always communicate directly with the air over a street, alley or yard. Whenever any such intake or duct consists of a passageway, the same shall be left open, or if not open there shall always be provided therein open grilles or transoms having an area of not less than three (3) per centum of the required area of said courts, and such open grilles or transoms shall never be covered over by glass or in any other way. There shall be at least two such grilles or transoms in each passageway, one at the street, alley or yard, and the other at the inner end of such passageway.

Sec. 24. Rooms—Sizes and Height of—Janitor's Rooms.—In every new tenement house all rooms, except water closet compartments and bath rooms, shall be of the following minimum sizes: In each apartment there shall be at least one room containing not less than one hundred and twenty (120) square feet of floor area and every other room shall contain at least seventy (70) square feet of floor area. Each room shall be in every part not less than eight (8) feet six (6) inches high from the finished floor to the finished ceiling; but an attic room need be eight (8) feet six (6) inches high in but one-half of its area; provided, that in a basement apartment, used for janitor's use only, such room or rooms shall not be less than eight (8) feet high in the clear.

Sec. 25. Rooms—Changes in Existing—In Courts—Attic.—No room in any now existing tenement house shall hereafter be constructed, altered, converted or occupied for living purposes unless it contains a window having a superficial area not less than one-twelfth (1-12) the floor area of the room, which window opens upon a street or alley or upon a yard or court having a sectional area of not less than twenty-five (25) square feet; or unless such room adjoins another room in the same apartment which other room has such a window opening upon such a street, alley, yard or court, and between which two adjoining rooms there is a sash window having at least fifteen (15) square feet of glazed surface, the upper half of which is so made as to open easily. Furthermore, no room in any now existing tenement house which has no such window, as aforesaid, opening upon a street or alley or upon a yard or court having a horizontal area of not less than twenty-five (25) feet, shall hereafter be constructed, altered, converted or occupied for living purposes, unless it contains a floor area of at least sixty (60) feet and also at least six hundred (600) cubic feet of air space; nor unless every part of the finished ceiling of such room be at least eight (8) feet distant from every part of the finished floor thereof; provided that an attic room need be eight (8) feet high in but one-half of its area.

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Sec. 26. Air Quantity for Each Person.—No room in any tenement house shall be so occupied that the allowance of air to each person living or sleeping in such room shall at any time be less than four hundred (400) cubic feet for each such person more than twelve (12) years old and two hundred (200) cubic feet for each such person of the age of twelve (12) years or under.

Sec. 27. Alcoves.—Every alcove shall be deemed a separate room for all purposes within the meaning of this ordinance, except such an alcove as, adjoining another room, has at least twenty (20) per centum of entire wall surface of alcove opening to another room.

Sec. 28. Halls — Light — Recesses — Returns — Doors in.—In every new tenement house every public hall shall be lighted by at least one window in each story opening directly upon a street, alley, yard or court, or by a skylight. Such window shall be so placed that light may pass directly through it and the hall to the opposite end of the hall, or else there shall be at least one window opening directly upon a street, alley, yard or court in every twenty (20) feet in length or fraction thereof of such hall, except in so much of any entrance hall as lies between the entrance and the flight of stairs nearest the entrance. In any such public hall, recesses or returns, the length of which does not exceed twice the width of the hall, will be permitted, without an additional window, but otherwise each recess or return shall be regarded for the purposes of this section as if it were a separate hall. And any part of a public hall which is shut off from any other part by a door or doors shall be deemed a separate public hall within the meaning of this section.

Sec. 29. Public Halls — Windows in.—In every new tenement house one at least of the windows provided to light each public hall or part thereof shall have a glass area of at least twelve (12) square feet.

Sec. 30. Rooms and Halls, Additional.—Any additional room or hall that may be hereafter constructed or created in an existing tenement house shall comply in all respects with the provisions of this ordinance as to size, arrangement, light and ventilation of rooms and halls.

Sec. 31. Shafts—Inner and Outer—Dimensions of.—Inner or outer vent shafts of all tenement houses, as defined in Section 1, Paragraph 5, of this ordinance, shall be of the following dimensions:

Building.	Square Feet.	Least Width.
2 stories	22½	3 feet
3 stories	27	3 feet
4 stories	36	3 feet
5 stories	48	5 feet
6 stories	72	6 feet
7 stories	96	8 feet
8 stories	120	8 feet

Sec. 32. Skylight, Ventilating over Stairs.—In every new tenement house there shall be in the roof directly over each stair well a ventilating skylight, the glazed surface thereof to be not less than twenty-five (25) square feet in area, unless such stairway is lighted by a window on each story landing.

Sec. 33. Flues in Walls.—In every new tenement house there shall be adequate flues in walls of masonry not less than forty-nine (49) square inches area in each chimney running through every floor, with an open fire-place or grate or place for a stove, properly connected with one of said chimney flues, for every apartment; every additional flue used shall not be of less size than the above.

Sec. 34. Cellar and Basement—Ceilings—Ventilation.—All cellar and basement ceilings, unless the floor construction be fire proof, shall be plastered, and that part of the ceiling over the boiler or furnace extending two (2) feet beyond in each direction shall be covered with metal lath and shall be plastered with cement, and every cellar shall be ventilated from both ends.

Sec. 35. Basement Walls and Floors to be Damp-proof.—Every new tenement house shall have all its walls and floors below the adjacent ground level made damp-proof and water-proof. Such damp-proofing and water-proofing shall run through the walls and up the same as high as the ground level, and shall be continued through the floor. Such floor shall be properly constructed so as to prevent water and dampness from entering.

Sec. 36. Cellar Changed for Habitable Purposes—Requirements.—In no now existing or new tenement house shall any room in the cellar be constructed, altered, converted or occupied for living purposes; and no room in the basement of a tenement house shall be constructed, altered, converted or occupied for living purposes unless all of the following conditions of this ordinance be complied with, and that at least one-third (⅓) of the height of the basement shall be above grade at building; provided, that in each case it shall be at least four (4) feet above the street grade:

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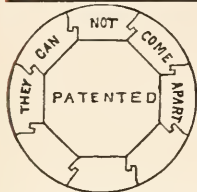


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(1). **Cellar Rooms—Height of.**—Such room shall be at least eight (8) feet six (6) inches high in all now existing or new tenement houses in every part from floor to the ceiling, except as provided for janitor's use only in Section 24 of this ordinance.

(2). **Room or Apartment to have Water Closet.**—There shall be appurtenant to such room or apartment a water closet conforming to the building and health regulations and ordinances of Chicago relating to water closets.

Sec. 37. Shafts, Areas, etc., to Extend 6 inches Below Floor—Graded—Concreted—Drained.—In every new tenement house the bottom of all shafts, courts and yards which extend to the basement for light and ventilation of living rooms in such basement must by means of areas not less than two (2) feet six (6) inches in their least dimension, or otherwise, be extended a distance of at least six (6) inches below the floor level of the part intended to be occupied. All shafts, inner courts and areas which extend to the ground shall be properly concreted, and all shafts, inner and lot line courts and areas shall be properly graded and drained and shall be so connected with a street sewer through an intermediate trap or surface basin (where such a sewer is adjacent to the lot) that all water may be drained freely into it.

Sec. 38. Sinks—Requirements.—In every new tenement house there shall be in each apartment at least one proper sink with running water. In every now existing tenement house there shall be on every floor at least one proper sink with running water, accessible to all the tenants of that floor, without passing through any other apartment, if there be not one such sink in each apartment. In no tenement house shall there be woodwork inclosing sinks located in the public halls; the space underneath sinks shall be left entirely open.

Sec. 39. Water Closets—Access to—Windows in—Artificial Light—Glazed Doors—Privy Vaults to be Replaced with Water Closets—In Existing Tenements.—In every new tenement house there shall be a separate water closet in a separate compartment within each apartment, accessible to each apartment without passing through any other apartment, provided that where there are apartments consisting of only one (1) or two (2) rooms there shall be at least one water closet for every two (2) apartments. All water closet compartments in every new tenement house must have a window opening upon a street, alley, yard, court or vent shaft, and every water closet compartment in every now-existing tenement house must be ventilated by such a window or else by a proper ventilating pipe running through the roof. Every water closet compartment in every tenement house must be provided with proper means of artificially lighting the same. If fixtures for gas or electricity are not provided in any such compartment, then the door thereof shall have ground-glass or wire-glass panels or transoms. No drip trays shall be permitted in new tenement houses. All water closet fixtures in every tenement house shall be constructed and set up conformably to the requirements of Sections 851, 853, 854 and 855 of the Health Code of the City of Chicago, and shall be left open and uninclosed. All privy vaults used in connection with any now-existing tenement house shall be replaced by water closets constructed and set up conformably to this ordinance and the above enumerated sections of the Health Code of the City of Chicago, whenever connection with a public sewer is in any way possible and the Department of Health of the City of Chicago shall be the sole judge as to the possibility of such connection with a public sewer. At least one such water closet shall be provided for every two apartments in each now-existing tenement house, and these water closets may be located in the yard if necessary. If so located, long hopper closets may be used, provided all traps, flush tanks and pipes be protected against frost.

Sec. 40. Pipes through Floors.—In every new tenement house where plumbing or other pipes pass through floors or partitions the openings around such pipes shall be sealed or made air-tight with plaster or other incombustible materials, so as to prevent the passage of air or the spread of fire from one floor to another or from room to room.

Sec. 41. Catch Basins.—The covers of all catch basins in lots containing tenement houses shall be of stone or iron, and shall be placed in courts or yards flush with the surface of such courts or yards, so that access to such basins may be convenient.

Sec. 42. Walls, Ceilings, Courts, &c., Whitewashed.—The cellar walls and ceilings of every tenement house shall be thoroughly whitewashed or painted a light color at least once every year; the walls of all courts, except those bounded on at least one side by a street or alley, and the walls of all shafts shall, unless built of light colored brick or stone, be thoroughly whitewashed once every three (3) years or painted a light color once every five (5) years. No tenement house not yet occupied shall be occupied in any part until the provisions of this section shall have been complied with.

Sec. 43. Hallways—Light to be Kept Burning in.—In every tenement house over two stories high a proper light shall be kept burning in the public hallways near the stairs, upon the entrance floor and the floor above the entrance floor, every night during the year, from sunset to sunrise, and upon all other floors of the building from sunset until 10 o'clock in the evening.

Sec. 44. Repairs in Tenements—Garbage Burning Furnace—Yards to be Kept Clean.—Every tenement house and every part thereof shall be kept in good repair and shall be clean and free from any accumulations of dirt, filth, garbage or other matter in or on the same, or in the yards, courts, passages, areas or alleys connected with or belonging to the same. Every new tenement house over two stories high shall be equipped with a practical garbage-burning furnace. The floor and other surface around or beneath any water closet and every sink in every tenement house shall be maintained in good order and repair. Every part of every tenement house and of every yard, court, passage, area or alley connected with or belonging thereto shall be at all times kept in a cleanly condition. No filth, urine or fecal matter shall be placed in any part of a tenement house, yard, court, passage, area or alley, except in such parts thereof as may be specially provided for that purpose, and no filth, urine or fecal matter shall be kept in or upon any tenement house, yard, court, passage, area or alley so long as to create a nuisance.

Sec. 45. Wall Paper to be Removed.—No wall paper shall be placed upon the walls or ceilings of any tenement house unless all old wall paper shall first have been removed therefrom and said walls and ceilings thoroughly cleansed.

Sec. 46. Restrictions as to Animals, Combustible Materials, &c.—No horse, cow, swine, pig, sheep or goat shall be kept in a tenement house, and no tenement house or part thereof shall be used for a stable or for the storage of any article dangerous to life or detrimental to health, or for the storage or handling of hay, feed, straw, cotton, excelsior, hemp, flax, shavings or rags or anything else combustible (except as permitted by law). In no event shall anything explosive or inflammable or any combustible material be stored or placed under any stairway in any tenement house.

Sec. 47. Stairways—Fire Escapes to be Kept Free from Incumbrances.—No incumbrance of any kind shall at any time be placed before, upon or against any stairway, steps or landings or fire escapes in or upon any tenement house. All fire escapes upon tenement houses shall be kept in good order and repair and every exposed part thereof shall at all times be protected against rust by durable paint.

Sec. 48. Water Closets—Access to.—In every apartment of three (3) or more rooms in every new tenement house, convenient access from the outer door of the apartment to every living room and to every bed-room and to every room used as a bed-room and to at least one water closet compartment shall be provided, otherwise than through any bed-room or room used as a bed-room.

Sec. 49. Buildings Damaged by Fire, &c.—If any existing tenement house hereafter damaged by fire or other cause (including ordinary wear) so that at any time its value be one-half or less than one-half its original value (exclusive of the value of the foundations) such building shall not be repaired or rebuilt except in conformity with the provisions of this ordinance applicable to new tenement houses.

Sec. 50. Changes or Alterations Require Permits.—Every new tenement house and all changes or alterations in any existing tenement house shall conform to all other requirements of law, as well as to the requirements of this ordinance. No new tenement house shall be begun, nor shall any changes or alterations in any existing tenement house, such as are referred to in this ordinance, be begun until a proper building permit thereof shall have been issued by the Building Department of the City of Chicago. And such building permit shall be issued only upon an application in writing, signed by the owner or his duly authorized agent (meaning by "owner" the party for whom the building is to be erected or altered), and after approval of the plans and specifications of such tenement house, or such changes or alterations, by the Health Department of the City of Chicago, as required by law.

Sec. 51. Certificate from Health Department to be Kept in Public View—Certificate Not Conclusive Evidence.—No new tenement house nor any existing tenement house, after any alterations thereof or any changes therein, such as are referred to in this ordinance, shall be occupied in whole or in part as a tenement house or for any human habitation, nor shall any water be furnished to such house, until the issuance of a certificate by the Department of Health of the City of Chicago, certifying that the house has the number of fire escapes required by the ordinance; also certifying that the yards, courts, shafts, areas, stairs, stair halls, public halls, apartments, rooms, compartments and windows have the dimensions and locations required by this ordinance and comply with this ordinance in respect to the number thereof required; also certifying that the drainage and plumbing (including fixtures) comply with the requirements of this ordinance. Every such certificate shall be kept at all times in public view in the entrance to such tenement house and shall be prima facie (but not conclusive) evidence that such house conforms to the requirements of this ordinance in the respects aforesaid.

Sec. 52. Must Comply with Requirements of Ordinance.—If any tenement house shall fail to comply with the provisions of this ordinance respecting fire-proof or slow-burning construction, only so many stories of such tenement house (being the stories

nearest the ground) shall be occupied as are by this ordinance permitted to tenement houses of the character of construction actually employed in such tenement house.

Sec. 53. Inspection at Any Time—Ten Days for Compliance with Order—Copy of Notice to be Posted.—Every tenement house may be inspected at any time by the Health Department of the City of Chicago, and whenever said department shall make an order concerning a tenement house, said department shall notify the owner thereof by mail of such order and in case of failure by said owner to comply with the requirement of said notice within ten (10) days after the mailing thereof, then a copy of said notice shall be posted in the entrance hall of said tenement house (and the posting of notice of such an order in the entrance hall shall be equivalent to personal service thereof upon the owner or agent of said house), a re-inspection shall be made within ten (10) days after said department shall be informed that the order has been complied with.

Sec. 54. Notice to be Sent to Commissioner of Buildings to Inspect—Certificate to be Issued—Notices to Inspect to be Filed.—It shall be the duty of the owner or his agent when a new tenement house is in course of erection to notify the Commissioner of Buildings of the City of Chicago when the building is or will be ready for lathing, and the Commissioner shall, within three (3) days of the time specified, cause an inspection to be made, and if the construction is found to be in accordance with the requirements of this ordinance, he shall issue, or cause to be issued, by the District Inspector a certificate to that effect; otherwise he shall cause the penalties named in Section 56 to be enforced. The Commissioner shall file for reference the notice received, and the District Inspector shall file a copy of the certificate in the office of the Building Department.

Sec. 55. Must Comply as to Yards, Courts, &c., with Ordinance—Failure to do so Declared a Nuisance.—Any tenement house not conforming in itself and in its yards, courts, areas and shafts to the requirements of this ordinance and of other laws applicable thereto, is hereby declared to be a public nuisance, and any proper and lawful proceedings may be taken to abate the nuisance due to such non-conformity to such requirements, notwithstanding the issuance of a building permit for the erection or alteration of such building, and notwithstanding the issuance of such a certificate of inspection as is provided for in Sections 51 and 53 of this ordinance.

Sec. 56. Fines.—Any owner, lessee, tenant, occupant or agent of any tenement house, or any architect, contractor, builder or foreman, violating, disobeying, neglecting or refusing to comply with or resisting any of the provisions of this ordinance shall, upon conviction, be fined not less than ten (\$10) dollars nor more than two hundred (\$200) dollars; and any breach of any provision of this ordinance if continued after the first fine thereof is imposed shall, for every week of such continuance, be punishable by an additional fine of not less than ten (\$10) dollars nor more than two hundred (\$200) dollars.

Sec. 57. Except for Safety, not Requiring Alterations, unless Transferred to Another Class by Enlargement, &c.—Excepting in cases where the immediate safety of the occupants of buildings is concerned, nothing in this ordinance shall be considered as requiring alteration in the construction or equipment of buildings existing at the time of the passage of this ordinance, and at that time, complying with the ordinance then in force. If, however, it is desired to enlarge, or in any manner materially modify the construction of any existing building, or to make change in its use or occupation, which will transfer it from one class, as recognized by this ordinance, to another, then before such enlargement or structural change or modification of building is made, or before such change in its use or occupation may be made, the entire building shall be reconstructed or modified in such manner as to bring the same, when enlarged or altered, or when occupied for its new and different purposes, in accordance with the provisions of this ordinance.

Sec. 58. Ordinance Not to Change Existing Powers.—Nothing in this ordinance shall be construed as abrogating or impairing the powers of the Department of Health of the City of Chicago or the Department of Buildings of the City of Chicago, or of the courts, to enforce any provisions of the laws of the State of Illinois or the ordinances of the City of Chicago applicable to tenement houses and their environments.

Sec. 59. Sections of Building Code and Ordinance of March 28, 1898, Repealed or Amended.—Those sections of the Building Code of the City of Chicago, being the ordinance passed March 28, 1898, numbered as follows, 110, 112, 114, 152, 153, 154 and 155, are hereby repealed, so far as the same relate to the tenement houses as defined in this ordinance; also the last sentence of Section 37 of ordinance of March 28, 1898, is hereby repealed, so far as the same relates to tenement houses as defined in this ordinance. Those sections of the Municipal Code of the City of Chicago of 1897, numbered as follows: 852, 1066, 1067, 1068, 1076 and 1078, are hereby repealed, so far as the same relate to tenement houses as defined in this ordinance; and section numbered 1070 of said code is hereby amended by adding at the end of the same the words, "no privy shall be allowed where connection with a public sewer is in any way possible." All other ordinances and parts of ordinances conflicting with this ordinance so far as they relate to tenement houses are also hereby repealed.

Sec. 60. This ordinance shall take effect and be in force from and after its passage.

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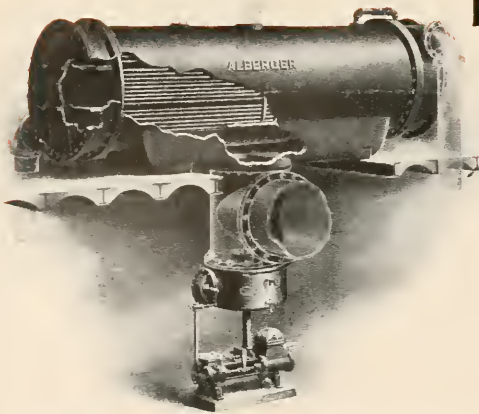
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THEATRE ORDINANCE

Governing the Construction of Buildings of Classes IV and V.

Passed by the City Council of the City of Chicago, January 18, 1904, and amended January 25, February 1, February 29 and March 29, 1904.

Be it ordained by the City Council of the City of Chicago:

Section 1. That the ordinance relating to the department of buildings and governing the erection of buildings, etc., in the City of Chicago, passed March 28, 1898, and all subsequent amendments thereto, be and the same is hereby amended as follows:

Strike out of said ordinance Sections 164 to 197, both inclusive, and said sections are hereby repealed.

Further amend said ordinance by adding thereto the following sections which shall apply only to buildings of Class IV. as defined by Section 65 of the ordinance.

"Section I. Class IV. Definition of—Outside Walls of Class IV.—Structures Built Above—Walls of.—Buildings of Class IV. shall include all buildings used as assembly halls for large gatherings of people, whether for purposes of worship, instruction or entertainment, except buildings used as public theaters where an admission fee is charged, and in which movable scenery is used.

The outside walls of all buildings of Class IV., the roof or ceiling of which is carried on trusses or girders of a span of fifty feet or more, shall have walls as follows:

If such walls are less than 25 feet high, not less than 20 inches thick.

If they are more than 25 feet and less than 45 feet high, they shall not be less than 24 inches thick.

If they are more than 45 feet and less than 60 feet high, they shall not be less than 28 inches thick.

If they are more than 60 feet and less than 75 feet high they shall not be less than 32 inches thick.

If they are more than 75 feet and less than 90 feet high, they shall not be less than 36 inches thick.

An increase of four inches in thickness of such walls shall be made in all cases where they are over 100 feet long without cross walls of equal height.

For rooms less than fifty feet wide, the thickness of such walls may be reduced by four inches.

If one or more stories are built above the room devoted to the uses of Class IV., and such stories are carried on trusses or girders, the thickness of walls shall be increased by four inches for each two stories or part thereof above every such room.

If solid masonry buttresses are employed, and placed sixteen feet or less apart, and extended to the foot of the trusses or girders carrying the ceiling, or if iron or steel pillars are inserted in such walls for the support of the superstructure, and at distances not more than eighteen feet between centers, and if such pillars extend to and carry the superimposed trusses and girders, the thickness of such walls may be reduced in proportion to the increase of strength afforded by such buttresses or pillars, but in no case shall any such wall be less than twelve inches thick in the top story, four inches shall be added, going downward, for each story, for each gallery, or for each twenty-five feet in height of blank wall.

Sec. 2. Pillars in Walls.—If iron or steel pillars are introduced in said walls the brick work around the same shall be bonded into that of the connecting walls and each of such pillars shall have no less than eight inches of brick wall around it, the brick being measured from the extreme outer dimensions of such iron or steel pillars.

Sec. 3. Frontage of Class IV.—Seating Less Than 800.—Buildings of Class IV. containing halls of a seating capacity for 800 persons or less, shall have for each hall a frontage upon two public spaces, of which at least one shall be a street, and of which the other, if it is not a street, shall be a public or private alley, not less than ten feet wide, opening directly on a public street.

Sec. 4. Frontage of Class IV.—Seating Over 800.—Buildings of Class IV., containing halls of greater seating capacity than 800 shall have for each hall a facing upon

three open spaces, of which at least one shall be a public street, while the two others, if not streets, shall be public or private alleys of a width of not less than ten feet each, opening directly on a public street.

Sec. 5. Class IV.—Construction Of.—Buildings of Class IV. with a seating capacity of not more than 600, may be built of ordinary construction. If they have a greater seating capacity than 600 and less than 1,500 seats, they shall be built of slow burning or of mill construction. If they have a seating capacity greater than 1,500 seats, they shall be built of entirely fire proof construction.

Sec. 6. Classes I., II., or III., Built in Conjunction with Class IV.—If buildings of Class IV. are built in conjunction with, or as a part of buildings devoted to the uses of Classes I., II., or III., then such buildings of Classes I., II., or III. shall be built of entirely fireproof construction if the connected building of Class IV. has a greater seating capacity than 1,500.

Sec. 7. Any Building Constructed with Class IV.—Any building higher than 60 feet and connected with or made part of any building of Class IV. shall be entirely of fireproof construction. Any building less than sixty feet in height and made part of any structure of Class IV. shall, if its case is not already covered by other provisions of this ordinance, be made of slow burning or mill construction.

Sec. 8. Openings Between Non-Fireproof Buildings.—In all cases where fireproof construction is not used for the whole of such connected buildings, there shall be at each connecting opening double iron doors between such buildings and the building connected therewith.

Sec. 9. Spires, Cupolas and Domes Upon Houses of Worship and Instruction.—Spires, cupolas, or domes of non-fireproof material may be erected as part of any house of public worship or instruction, if the same is used for these purposes only, and if such house of public worship or instruction is so built that it is nowhere nearer than twenty feet to any line of the lot upon which it stands, street and alley lines excepted, and such non-fireproof spires or domes may be maintained only while this intervening space of twenty feet is made and maintained as part of the grounds of the owners of such house of public worship or instruction. In case the above is complied with, such spire or dome may be built with a framework of combustible material which shall, however, be covered on the outside with porous terra cotta, hollow tile or mortar, and upon this, with a weatherproof covering of steel metal, slate or glazed tile, the same as elsewhere specified for roofs of the same type of construction.

Sec. 10. If Conditions Violated—Dome Must Be Taken Down.—Roofs of Isolated Buildings of Class IV.—If the twenty feet of vacant ground, before mentioned, as one of the conditions upon which the building of spires and domes having a combustible frame work is permitted, shall be built upon, then such spire or dome shall be taken down.

The roofs of isolated buildings of Class IV. shall be constructed in the same manner as that provided for spires, domes and cupolas.

Sec. 11. Limitations of Floor Levels of Class IV.—Auditorium Floor of Class IV.—Height Above Sidewalk.—The following limitations of floor levels in buildings of Class IV. shall be observed in all cases. As amended Feb. 20, 1904.

In buildings of Class IV. no auditorium of a larger seating capacity than 1,000 shall have the highest part of its main floor at a greater distance than eight feet above the adjacent sidewalk grades. No room of any building of Class IV. of larger seating capacity than 500 shall be at a greater distance from the sidewalk grade than thirty feet. No room of Class IV. of larger seating capacity than 200 shall be at a higher level above the sidewalk grade than forty-five feet.

The only exception to the foregoing shall be the case of rooms of buildings of Class IV. of a seating capacity less than 500, which, in fireproof buildings, may be located in any story thereof, but in such case there shall be at least two flights of stairs from the floor in which such audience room or auditorium of Class IV. is located, to the ground, each of which stairs shall be not less than four feet wide in the clear.

Sec. 12. Class IV.—Stairs of—Stairways of—Entrances and Exits of.—Stairs in buildings of Class IV. shall be in width equivalent to eighteen inches for every 100 seats in such building, fractional parts of 100 being in each case counted as a full 100 seats; but no stairway in such building shall be less than four feet wide in the clear; Provided, however, that this provision shall not apply to existing buildings of this class having two or more stairways of at least three feet each in width. All stairways shall have railings on each side thereof. No stairways shall ascend a greater height than eleven feet without a level landing, which, if its width is in the direction of the run of the stairs, shall not be less than three feet wide, or which, if at a turn of the stairs, shall not be of less width than the width of the stairs.

Distinct and separate places of exit and entrance shall be provided for each gallery above the first. A common place of exit and entrance may serve for the main floor of the auditorium and the first gallery, provided its capacity be equal to the aggregate capacity of the outlets from the main floor and the said gallery. (As amended March 29, 1904.)

Sec. 13. Class IV.—Aisles Of—Steps in Aisles Of—Passageways Of—Kept Unobstructed—Width of Corridors—Passages, Hallways and Doors Of.—Aisles in buildings of Class IV. shall be in width equal to eighteen inches for every 100 seats or fractional part thereof, and the occupants of which will be required to use such aisle, but no aisles shall be less than two feet, six inches wide in its narrowest part.

Steps shall be permitted in aisles only as extending from bank to bank of seats, and whenever the rise from bank to bank of seats is less than six inches the floor of the aisle shall be made as an incline plane, and where steps occur in outside aisles or corridors, they shall not be isolated but shall be grouped together, and there shall be a lamp at or near every place where there are steps in enclosing aisles or corridors.

All aisles and passageways in said buildings shall be kept free from camp stools, chairs, sofas, and other obstructions, and no person shall be allowed to stand in or occupy any of said aisles or passageways during any performance, service, exhibition, lecture, concert, ball, or any public assembly, nor shall there be any chairs, settees or camp stools in such aisles or corridors at such times or occasions.

The width of corridors, passages, hallways and doors shall be computed in the same manner as that herein provided for stairways and aisles, excepting, however, that no corridor shall be anywhere less than five feet in width, and no door less than three feet wide.

Sec. 14. Class IV.—Emergency Exits Of.—Emergency exits and stairways shall be provided outside of the walls of all assembly halls in buildings of Class IV. of a larger seating capacity than \$00.

The aggregate width of such emergency exits which shall be provided for each floor, balcony and gallery of such building, shall be one-half of that provided for the main exits, and no emergency exit, door or stairway shall be less than three feet in width.

The frame work of such stairs shall be made of iron, and the treads of wood. Such emergency exits shall be kept free of obstructions of all kinds, including snow.

Sec. 15. Class IV.—Doors Of, Open Outward—Walls Between Auditorium and Stage Of.—All doors in buildings of Class IV. shall open outward.

In buildings of Class IV. there shall be a solid brick wall, of the same thickness as that called for on the outside walls, between the auditorium and stage; and in non-fireproof buildings the wall shall extend to a height of six feet above the roof. The main curtain opening shall have an iron or asbestos curtain, and all other openings in this wall shall have iron doors.

Sec. 16. Structure Over Ceilings of Class IV.—Construction Of.—If any structure is built over the ceiling or roof of any building of Class IV. the different members of the girders or trusses supporting same shall have their fire-proofing double, in the manner described for pillars of fire-proof buildings of Class I.

Sec. 17. Diagram of Exits Printed on Programs.—It shall be the duty of the owner, lessee or manager of every building of Class IV. during the performances of which programs are issued, to cause to be printed on such programs a diagram showing conspicuously the exits of such buildings.

Sec. 18. Sign Over Exits of Class IV.—All exits opening in buildings of Class IV. shall have the word "exit" in letters at least six inches high, applied to the auditorium side and to the stage side of every exit.

Sec. 19. Fire Apparatus on Stage of Class IV.—In all buildings of Class IV. where stationary scenery is used, of a seating capacity of 250 or more, there shall always be kept for use portable fire extinguishers or hand fire pumps on and under the stage, and also four Fire Department axes, two 25-foot hooks, two 15-foot hooks and two 10-foot hooks on each tier or floor of the stage, subject to the approval of the Fire Marshal and the Commissioner of Buildings.

Sec. 20. License of Class IV.—The license for each building of Class IV. shall state the number of persons it has accommodations for and no more than that number shall be allowed to enter such hall at any one time, which number shall be governed by the number of feet of exit, of the doors and passages, and shall be approved by the Commissioner of Buildings.

Sec. 21. All Parts of Class IV. Well Lighted During Performance.—Every portion of any building of Class IV. devoted to the uses or accommodation of the public, also all outlets leading to the streets, and including the open courts and corridors, stair-

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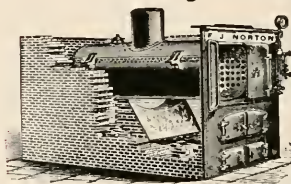
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ways and exits shall be well and properly lighted during every performance, and the same shall remain lighted until the entire audience has left the premises.

Sec. 22. Control of Light in Halls, Corridors and Lobbies.—Connection with Gas Mains.—Protection of Suspended and Bracket Lights.—Protection of Lights Inserted in Walls.—Protection of Foot Lights.—Construction of Border Lights.—Ducts and Shafts Conducting Heated Air From Lights.—Protection of Stage Lights.—Buildings of Class IV.—All gas or electric lights in the halls, corridors, lobby or any other part of said buildings used by the audience, except the auditorium, shall be controlled by a separate shut-off, located in the lobby, and controlled only in that particular place. Gas mains supplying such building shall have independent connections for the auditorium and the stage, and provision shall be made for shutting off the gas from the outside of the building. All suspended or bracket lights surrounded by glass, in the auditorium or in any part of the building shall be provided with proper wire netting underneath. No gas or electric light shall be inserted in the walls, woodwork, ceilings, or in any part of the building unless protected by fire proof materials. The footlights, in addition to the wire net work, shall be protected by a strong wire guard, not less than two feet distant from said footlight, and the trough containing said footlights shall be formed of and be surrounded by fire proof materials. All border lights shall be constructed according to the best known methods, and subject to the approval of the Commissioner of Buildings and the Fire Marshal, and shall be suspended for ten (10) feet by wire rope. All ducts and shafts used for conducting heated air from the main chandelier, or from any other light or lights, shall be constructed of metal, and made double, with an air space between them. All stage lights, if gas, shall have strong metal wire guards or screens, not less than ten (10) inches in diameter, so constructed that any material in contact therewith shall be out of reach of the flames of stage lights, and shall be soldered to the fixtures in all cases.

Sec. 23. Under Control of Fire Marshal and Commissioner of Buildings.—The stand-pipes, gas pipes, electric wires, hose, foot-lights, and all apparatus for the extinguishing of fire, or guarding against the same, as in this ordinance specified, shall be at all times made and kept in condition satisfactory to and under the control of the Fire Marshal and the Commissioner of Buildings of the City of Chicago.

Sec. 24. Commissioner and Fire Marshal Empowered to Enter Class IV.—The Commissioner of Buildings, Fire Marshal and their respective assistants shall have the right to enter any building of Class IV., and any and all parts thereof, at any reasonable time, especially when occupied by the public, in order to properly judge of and discharge their respective duties; and it shall be unlawful for any person to refuse admission to such officers or to throw obstacles in the way of such officers while engaged in the performance of their duties.

Sec. 25. Commissioner of Buildings or Fire Marshal May Order Closed—Class IV.—The Commissioner of Buildings or Fire Marshal shall have the power to order any building of Class IV. to be closed where it is discovered that there is any violation of the provisions of this ordinance, until the same are complied with.

Sec. 26. Mayor Revoke License of Class IV.—Upon the report to the Mayor by the Department of Buildings, or of the Fire Marshal, that any order or requirement of this ordinance in regard to buildings of Class IV, has been violated or not complied with, in any such building, the Mayor shall revoke the license of such theater, or place of public amusement, and cause the same to be closed.

CLASS V.

Sec. 27. Class V.—Definition Of—Outside Walls Of—Structures Built Above.

Class V. shall embrace all buildings which are used as public theaters where an admission fee is charged, and in which movable scenery is used.

The outside walls of all buildings of Class V. the roofs or ceilings of which are carried on trusses or girders of a span of fifty feet or more, shall be as follows:

If such walls are less than 25 feet high, not less than 20 inches thick.

If they are more than 25 feet and less than 45 feet high, they shall not be less than 24 inches thick.

If they are more than 45 feet and less than 60 feet high, they shall not be less than 28 inches thick.

If they are more than 60 feet and less than 75 feet high, they shall not be less than 32 inches thick.

If they are more than 75 feet and less than 90 feet high, they shall not be less than 36 inches thick.

An increase of four inches in thickness of such walls shall be made in all cases where they are over 100 feet long without cross walls of equal height.

The thickness of such walls for rooms less than fifty feet wide may be reduced by four inches.

If one or more stories are built above the room devoted to the uses of Class V. and such stories are carried on trusses or girders, the thickness of walls shall be increased by four inches for each two stories or part thereof above such room.

If solid masonry buttresses are employed and placed sixteen feet or less apart, and extended to the foot of the trusses or girders carrying the ceiling, or if iron or steel pillars are inserted in such walls for the support of the superstructure, and at distances not more than eighteen feet between centers, and if such pillars extend to and carry the superimposed trusses and girders, the thickness of such walls may be reduced in proportion to the increase of strength afforded by such buttresses or pillars, but in no case shall any such wall be less than twelve inches thick in the top story, and four inches shall be added, going downward, for each story, for each gallery, or for each twenty-five feet in height of blank wall.

Sec. 28. Pillars in Walls.—If iron or steel pillars are introduced in said walls, the brick work around the same shall be bonded into that of the connecting wall, and each of such pillars shall have not less than eight inches of brick wall around it, the brick being measured from the extreme outer dimensions of such iron or steel pillars.

Sec. 29. Location—Open Spaces and Enclosed Passages.

All buildings of Class V., hereafter erected, shall be located so that they adjoin at least two public thoroughfares. All floors, balconies and galleries of the audience room or auditorium, including the stage of such building, shall be surrounded on four sides by either open spaces or enclosed fireproof passages, both of which shall be outside of the audience room or auditorium, and shall open on or connect directly with such public thoroughfares, and shall at all times be kept and maintained free and clear of obstructions.

Such open space or enclosed passageway shall not, in any event, be less than eight feet in width clear of any and all obstructions, except stairways. Index signs reading "This Way Out" shall be placed conspicuously in such open spaces and passageways.

Sec. 30. Class V.—Construction Of—Alterations in Existing Buildings.—All buildings of Class V. hereafter erected shall be built entirely of fireproof construction.

All alterations in existing buildings of Class V. intended to make them comply with the requirements of this ordinance may be executed in the same materials of construction at present employed in such buildings, unless otherwise distinctly provided by this ordinance.

Sec. 31. Classes I., II., III. or IV. Built in Conjunction with Class V.—Doors for Openings Between Connecting Buildings.—If buildings of Class V. are built in conjunction with or as part of buildings devoted to the uses of Classes I., II., III., or IV., then such buildings of Classes I., II., III. or IV. shall be built entirely of fireproof construction.

In all cases where existing buildings of Class V. are built in conjunction with or as part of buildings devoted to the uses of Classes I., II., III. or IV., and where such buildings of Classes I., II., III. or IV. are not built entirely of fireproof construction, double iron doors shall be placed at each connecting opening between such buildings of Class V. and the building connected therewith.

Sec. 32. Limitations of Floor Levels.—Exception.—Existing Theaters.—In all buildings of Class V. hereafter constructed, the following limitations of floor levels shall govern:

In all cases where the floors of the auditorium of the buildings of Class V. are banked or stepped up, the floor level of the lowest banks shall not be above the sidewalk level.

The audience room or auditorium in any building of Class V., now existing or which shall hereafter be constructed, containing less than 500 seats, if in a fireproof building, may be located in any story thereof, but in such case there shall be at least two separate stairways from the floor in which such audience room or auditorium is located to the ground, each of which stairs shall not be less than four feet in width in the clear.

This section governing floor levels shall not apply to buildings of Class V. now existing where the lowest bank of seats of the main floor is not more than twelve feet above the street level. But such building must be fireproof and in all other respects conform to the requirements of the ordinance.

Sec. 33. Class V.—Stairs Of—Stairways Of—Entrances and Exits Of.—Stairs in buildings of Class V. shall be in width equivalent to 20 inches for every 100 seats and fractional parts thereof in such buildings, but in no event shall any stairway in such building be less than four feet wide in the clear.

Each balcony and each gallery shall have immediate access to its proportionate amount of such stairway space, based upon the equivalent of 20 inches of space for every 100 seats in such balcony or gallery.

All stairways shall have hand-railings on each side thereof. Stairways shall not ascend a greater height than eleven feet without a level landing, which shall not be of less width than the stairs; no run of stairs shall consist of less than six risers between platforms, and risers shall not be placed on return platforms.

Floors at all exits shall be so designed as to be level and flush with adjacent floors and shall extend for an unbroken width of not less than four feet in front of each exit and shall be two feet wider than such exit.

Steps shall not have a greater rise than seven inches, treads shall not be narrower than eleven inches, and winders shall not be used on any staircase.

The main floor and also each and every balcony and gallery shall have entrance stairways from the street level, separate and distinct from every other entrance stairway.

There shall be iron stairways from the gridiron and from the fly gallery above the stage to the roof of the building or to some fireproof passageway or exit.

All stairs on the stage side of the proscenium wall shall not be less than two feet six inches wide.

In the case of existing theaters instead of increasing the width required for aisles, exits and stairways to the basis of 20 inches per 100 seats, the owner, lessee or manager shall have the privilege of reducing the number of permanent seats until the same ratio between said width and number of seats shall be established, and if such privilege be taken advantage of it shall be the duty of the Commissioner of Buildings to make inspection and certify that said ratio actually exists before license for operation of said theater shall be issued.

Sec. 34. Aisles and Seating—Aisles and Passageways Of—Kept Unobstructed.—Existing Theaters.—Aisles and seating in buildings of Class V. shall be as follows:

The minimum width of aisles with diverging sides shall be two feet eight inches at the end near the stage, and not less than three feet at the other end.

The minimum width of aisles with parallel sides shall be three feet.

Every aisle shall lead directly to an exit.

More than ten seats in any one row between aisles shall not be lawful.

In buildings of Class V. hereafter constructed seats shall be not less than twenty-two inches in width measured at the top of the seat backs.

In buildings of Class V. hereafter constructed rows of seats shall be not less than two feet ten inches from back to back; provided that in existing theaters a minimum width of twenty inches per seat will be permitted. And a minimum distance of two feet eight inches from back to back of seats will be permitted. There shall not be any bank of seats of a greater rise than 18 inches.

All groups of seats shall be so arranged that there shall be an aisle at each side of each group.

The number of banks of seats on the "main floor" shall not exceed fifteen unless an intervening or cross-aisle or a direct exit for each aisle is provided.

The number of banks of seats in the "balcony" shall not exceed five unless an intervening or cross-aisle leading directly to an exit is provided.

The number of banks of seats in all "galleries" shall not exceed four unless an intervening or cross aisle leading directly without turn to an exit is provided.

No foyer shall be open to the theater proper except through the exits.

The seats on the lower floor of all theaters shall be designated as the "main floor."

Where there are balconies or galleries, the first shall be designated the "Balcony" and the second and third shall be designated respectively "First Gallery" and "Second Gallery." These designations shall be printed plainly on all tickets.

Steps shall not be permitted in aisles except as extending from bank to bank of seats, and wherever the rise from bank to bank of seats is less than five inches the floor of the aisles shall be made as an inclined plane, and where steps are placed in outside aisles or corridors, they shall not be isolated, but shall be grouped together, and a light shall be placed and maintained so as to clearly light every place where there are steps in enclosing aisles or corridors.

All aisles, passageways and corridors shall be kept free from camp stools, chairs, sofas, and other obstructions, and no person shall be allowed to stand in or occupy any of said aisles, passageways or corridors during any performance, service, exhibition, lecture, concert or any public assemblage.

The width of corridors, passageways, hallways and doors shall be computed in the same manner as that hereinbefore provided for stairways, excepting, however, that no corridor shall be anywhere less than four feet in width, and no door less than three feet wide.

All corridors, passageways, hallways and stairways, leading from any balcony or gallery to any toilet room, retiring room, smoking room, check room, or private office, shall permit of free passage, without returning, to an outer exit of the building. Said corridors, passageways, hallways and stairways shall be at least three feet in width

in every part between said balcony or gallery and said outer exit, and shall be unobstructed in every part except by doors, not less than three feet in width, in the clear, which shall swing outward and which shall be provided with no locks or catches of any kind whatever.

The entrance doors shall be of sufficient width to accommodate the entire audience, computed on the basis of twenty (20) inches of width in the clear to each one hundred (100) permanent seats or fraction thereof of the audience room or auditorium.

No mirrors shall be so arranged as to give the appearance of a doorway, exit, hallway or corridor, when no such doorway, exit, hallway or corridor is really in existence at said mirrors, nor shall there be any false doors or windows giving the appearance of an opening where none really exists.

Sec. 35. Emergency Exits, Width Of.—Emergency Stairs, Width Of.—Emergency Exits Inside Walls of Buildings.—Fire Escapes, Construction Of.—Fire Escapes Leading to Street or Alley.—Doors Open Outward.—Emergency exits and stairways shall be provided separately for each floor, balcony and gallery of every building of Class V. They shall be of the same size as that provided for the main exits, and no emergency exit, door or stairway shall be less than three feet in width. Such emergency stairs shall be made of iron, steel or other non-combustible material. Such emergency exits shall be kept free of all obstruction of all kinds, including snow and ice.

Such emergency exits and stairways may be built inside the walls of the building, provided they are surrounded by a fireproof partition not less than four inches thick separating the exits and stairways from the audience room or auditorium.

Additional emergency exits shall be provided and located on each floor, balcony and gallery directly and without turn in the rear of the rear bank of seats and opposite each aisle provided on each floor, balcony and gallery.

If such emergency exit lead outside the building, the doors leading thereto shall have metal frames filled with wire glass doors opening outward, hung from the inside corner of the jambs, and so constructed as not to project, when opened, beyond the outside face of wall and outer shutters shall not be permitted.

Wherever any such emergency stairway passes over an exit door or window or other opening, said stairway shall be completely enclosed for a space of five feet greater in width than said opening, by iron, steel or other incombustible material.

All such emergency exits and stairways shall land at the ground level in a public thoroughfare or in some space that connects directly with a street or alley, and direct and immediate exit to such public thoroughfare shall not be obstructed by any door, gate, bars or other obstruction of any character.

Every court in which there shall be a fire escape shall have direct and unobstructed access along the surface of the ground to a street, alley or yard opening into an alley or street without entering into or passing through or over any building unless by a four-foot wide fireproof passage on the court or ground level.

All doors in all openings shall be so constructed that when opened they shall not obstruct any portion of any other doorway, opening or passageway.

All doors in buildings of Class V. shall open outward upon suitable hinges.

Exit doors shall not be obscured by draperies, and shall not be locked or fastened in any manner during the entire time said theater is open to the public, but shall be so constructed and maintained that they can be opened from the interior without resistance.

Sec. 36. Brick Wall Between Auditorium and Stage.—Steel Curtain Fireproofed on Stage Side.—No Combustible Material on Audience Side.—Plans for Curtain.—Permit From Building Department.—In buildings of Class V. there shall be a solid brick wall of the same construction and thickness as that called for in the outside walls, between the auditorium and the stage. The main proscenium opening shall have a substantial vertically operated steel curtain, fireproofed on the stage side, which shall be raised and lowered by mechanical power and which shall be in constant use as the regular curtain and act-drop.

No combustible material other than painted decorations shall be applied to the audience side of said curtain.

Plans for said curtain shall be approved by the Building Department and a permit obtained for its erection. The Building Department shall inspect said curtain semi-annually.

All other openings in the said wall shall have iron doors, frames and thresholds.

Sec. 37. Construction of Stage.—Fireproof Paint.—The framing of the floor of every stage of buildings of Class V. shall be of iron or steel. The stage floor may be of wood, but shall not be less than two and three-fourths inches thick. The entire floor construction and floor of fly-galleries and rigging lofts, all railings and supports and stanchions thereon, and all sheaves, pulleys and cables and their supports shall

be of iron or steel. All woodwork, including the under side of floor boards, and all framing for scenery used on or about the stage shall be coated with a fireproof paint, the qualities of which shall be submitted to and approved by the Commissioner of Buildings. All wood used for floor and floor supports in buildings of Class V. shall be coated on the under side with the same kind of paint.

No scenery shall be used upon the stage of any building of Class V. unless such scenery shall have been treated with a paint or chemical solution which shall make it non-combustible, provided that any scenery so treated shall not be used upon the stage of any such building, until the Commissioner of Buildings, after a sufficient test of such scenery, has approved it as being non-combustible.

All doorways or openings in the rear or sides of the stage shall be vestibuled or protected in a manner satisfactory to the Commissioner of Buildings so as to protect the curtain, scenery and auditorium against draughts of air. (As amended Feb. 1, 1904.)

Sec. 38. Structures Over Ceilings of Class V.—Construction Of.—If any structure is built over the ceiling or roof of any building of Class V. the different members of the girders or trusses supporting same shall have their fireproofing double, in the manner described for pillars of fireproof buildings of Class I.

Sec. 39. Vents—Size Of.—Flue Pipes.—Dampers.—Switches for Dampers.—One or more vents suitable for the carrying away of smoke, equivalent in area to at least one-twentieth of the area of the stage, shall be provided in connection with the stage, and near the top thereof, in every building of Class V.

Or a flue pipe or flue pipes of metal construction or of other non-combustible material, extending not less than fifteen (15) feet above the highest part of the roof over the stage of said building, shall be over the stage of every building of Class V., and said flue or flues shall have an area of at least one-twentieth of the total area of the stage.

All such flues or vents shall be provided with dampers which shall be made of metal, and shall be opened by a closed circuit battery, and also by a mechanical device, suitable to and approved by the Commissioner of Buildings.

Such dampers shall be controlled by two switches, one at the electrician's station on the stage, which station shall be fireproof, and the other at the city fireman's station, on the opposite side of the stage; said switches shall be located in such places on the stage as are designated by the Fire Marshal, and each shall have a sign with plain directions as to the operation of same printed thereon.

All fuse boxes shall be surrounded by two thicknesses of fireproof material, with an air space between, and no fuses shall be exposed to the air between the switchboards, and all of which shall be approved by the City Electrician.

Sec. 40. Automatic Sprinklers—Location Of.—Tank Connections.—In every building of Class V. there shall be provided an approved system of automatic sprinklers, with approved automatic closed circuit electric devices connecting the valves regulating the flow of water into the various sprinkler pipes with the headquarters of the City Fire Alarm Telegraph and such other place or places as the Fire Marshal shall direct, so arranged as to prevent any tampering with the system or the shutting off of the water from the sprinkler pipes without automatic notice to the Fire Department.

This system of automatic sprinklers shall be supplied with water from a tank located not less than 20 feet above the level of the highest sprinkler head in the system, and it shall be the duty of the firemen provided for in Section 45 to include in their daily report the result of an inspection to determine the sufficiency of water in this tank. Automatic sprinklers shall be placed above and below the stage; also in paint room, storeroom, property room, scene storage room, carpenter shop, elevator shafts, passageways and dressing rooms, if they are in or connected with a building of Class V. Such tank shall not be connected with a standpipe and ladder system, but it shall be filled through a separate pipe from a fire pump, and a three-inch iron pipe shall extend from said tank to the outside of such building, with Siamese connections for fire department use. Such entire automatic sprinkler system and equipment shall be subject to the approval of the Fire Marshal of Chicago.

Sec. 41. Fire Apparatus on Stage—Hand Fire Pumps—Fire Materials.—A standpipe shall be installed on each side of the stage of all buildings of Class V., with a hose connection at each level above and below the stage, and hose connected thereto, with a self-opening valve, hose-reel device. Such standpipes shall be connected with a tank on the roof and in turn with a power pump, all of which shall be subject to the approval of the Fire Marshal. Portable fire extinguishers or hand fire pumps shall always be kept ready for use on and under the stage; in fly galleries and in rigging loft, and in addition thereto, at least four (4) fire department axes, two (2) twenty-five (25) foot hooks, two (2) fifteen (15) foot hooks, and two (2) ten (10) foot hooks shall be kept ready for use on each tier or floor of the stage, all of which shall be subject to the approval of the Fire Marshal.

The use of ordinary hot air furnaces or stoves in any building of Class V. is strictly prohibited.

Sec. 42. Diagram of Exits Printed on Programs.—It shall be the duty of the owner, lessee or manager of every building of Class V., during any performance for which programs are issued, to cause to be printed on such programs, on the page opposite that upon which the cast is printed, a diagram showing conspicuously all exits of such building; and a diagram of seats of each floor of every building of said class, and the exits leading from each floor drawn to a scale of one-eighth ($\frac{1}{8}$) inch to the foot, shall be hung in a frame within two (2) feet of the ticket seller's window of such building.

Sec. 43. Independent Lighting System for Exits.—"Exit" and Red Light.—All stairways or corridors throughout all buildings of Class V. shall be supplied with a supplementary lighting system of electricity, gas or sperm oil, and such system shall be independent of all other lights in such building, and shall be in operation during the entire period such theater is open to the public and until the audience has left the building. The word "Exit" shall be in letters at least six inches high over the opening to every means of egress from such building, and a red light, furnished by sperm oil, shall be kept burning over said word "Exit" at every such opening, during the entire period such theater is open to the public and until the audience has left the building.

Sec. 44. Fire Alarm Apparatus.—All buildings of Class V. shall be provided with an approved system of automatic or manual fire alarm telegraph apparatus, connected by the necessary wires with the headquarters of the City Fire Alarm Telegraph and such other place or places as the Fire Marshal shall direct. The number and location of the boxes and the character of the system, whether automatic or manual, or both, shall be determined by the Fire Marshal.

Sec. 45. Employment of Firemen.—Duties of Firemen.—It shall be the duty of the person, firm or corporation maintaining and operating a theater in every building of Class V. to employ two or more competent, experienced firemen, who shall be detailed by the Fire Marshal; shall be in the uniform of the Chicago Fire Department; shall be on duty at each theater during the whole time it is open to the public; shall report to and be subject to the orders of the Fire Marshal, shall see that all fire apparatus required by this ordinance is in its proper place, in proper condition ready for use, all exits unlocked during the whole time such theater is open to the public, and all in efficient and ready working order. Said firemen and said Fire Marshal shall require a drill of the employees of said theater for the use of all apparatus and appliances for the prevention of fire inside the building at least twice in every week, and said firemen shall report to said Fire Marshal the manner and efficiency of said drill. Said firemen shall report in writing daily to the Fire Marshal the condition of the theater to which they are detailed, and its equipment. No fireman shall be on duty at any one theater for a period longer than two weeks.

Sec. 46. Licenses.—The license for each building of Class V. shall state the number of permanent seats it contains, which number shall be governed by the foregoing provisions of this ordinance relating thereto, and no more than that number of persons shall be permitted to enter such theater at any one time.

No license for the operation of a building of Class V. shall be issued by the officer designated by the ordinance unless the Commissioner of Buildings and the Fire Marshal shall first have certified, in writing, to such officer that such building complies with the building ordinance in every respect.

It shall be the duty of the Superintendent of Police to enforce the provisions of this section.

It shall be the duty of the person, firm or corporation operating a theater in every building of Class V. to employ one policeman, detailed by the Superintendent of Police, who shall be in the uniform of the Chicago Police Department, who shall be on duty at each theater during the whole time it is open to the public; shall report to and be subject to the orders of the Superintendent of Police; carry out all orders of said Superintendent; see that the provisions of this section are properly enforced and maintain proper decorum in such buildings.

Sec. 47. All Parts Well Lighted During Performances.—Every portion of buildings of Class V. devoted to the uses or accommodation of the public, also all outlets leading to the streets and including all open courts, corridors, stairways and exits, shall be well and properly lighted during every performance, and the same shall remain lighted until the entire audience has left the premises.

Sec. 48. Control of Lights in Halls, Corridors and Lobbies—Separate Shut-off—Connections With Gas Mains—Independent Connections—Protection of Suspended and Bracket Lights—Protection of Lights Inserted in Walls—Protection of Footlights—Construction of Border Lights—Ducts and Shafts Conducting Heated Air From Lights—

Gas Stage Lights to Have Metal Screens.—All gas or electric lights in the halls, corridors, lobby or any other part of every building of class V. used by the audience, except the auditorium, shall be controlled by a separate shut-off, located in the lobby, and controlled only in that particular place. Gas mains supplying the building shall have independent connections for the auditorium and the stage, and provision shall be made for shutting off the gas from the outside of the building. All suspended or bracket lights surrounded by glass, in the auditorium, or in any other part of the building, shall be provided with proper wire netting underneath. No gas or electric lights shall be inserted in the walls, woodwork, ceilings, or in any part of the building, unless protected by fireproof materials. In case gas is used, the footlights, in addition to the wire net work, shall be protected by a strong wire guard, not less than two feet distant from said footlights, and the trough containing said footlights shall be formed of and surrounded by fireproof materials. All border lights shall be constructed according to the best known method, and subject to the approval of the Commissioner of Buildings, and the Fire Marshal, and shall be suspended by wire rope. All ducts and shafts used for conducting heated air from the main chandelier, or from any other light or lights, shall be constructed of metal and made double, with an air space between them. All stage lights, if gas, shall have strong metal wire guards or screens, not less than ten (10) inches in diameter, so constructed that any material in contact therewith shall be out of reach of the flames of stage lights, and shall be soldered to the fixtures in all cases.

The use of calcium lights in buildings of Class V. is strictly prohibited. All arc lights used on the stage shall at all times be subject to the approval of the City Electrician, and no arc light shall be used on any stage of buildings of Class V. unless first approved by the City Electrician.

Sec. 49. Fire Apparatus to Be Under Control of Fire Department.—The stand-pipes, automatic sprinklers, gas pipes, electric wires, hose, footlights, fire alarm boxes, fireproof proscenium curtain, switch-boxes, ventilators, controlling levers, axes and hooks, and all apparatus for the extinguishing of fire, or guarding against the same, as provided for by this ordinance for buildings of Class V. shall at all times be made and kept in condition satisfactory to and under control of the Fire Marshal of the City of Chicago.

Sec. 50. Commissioner, Fire Marshal, Superintendent of Police Empowered to Enter Buildings of Class V.—The Commissioner of Buildings, Fire Marshal, the Superintendent of Police, and their respective assistants, shall have the right to enter any building of Class V. and any and all parts thereof, at any reasonable time, especially when occupied by the public, in order to examine said buildings to properly judge of the condition of the same and to discharge their respective duties, and it shall be unlawful for any person to interfere with them in the performance of their duties.

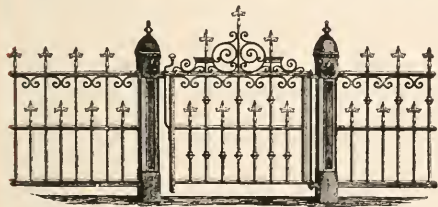
Sec. 51. Commissioner, Fire Marshal, or Superintendent of Police Shall Close Buildings for Violations.—The Commissioner of Buildings, the Fire Marshal or the Superintendent of Police shall have the power and it shall be their duty to order any building of Class V. to be closed, where it is discovered that there is any violation of the provisions of this ordinance until the same are complied with.

Sec. 52. Mayor Shall Revoke License of Class V.—Upon the report to the Mayor by the Department of Buildings, the Fire Marshal or the Superintendent of Police, that any requirement of this ordinance governing buildings of Class V. or that any order given by them in regard thereto has been violated, or not complied with, in any such building, the Mayor shall revoke the license of such theater or place of public amusement, and cause the same to be closed.

This ordinance shall be in force from and after its passage and due publication.

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SIDEWALKS AND VAULT COVERING.

SYNOPSIS OF SPECIFICATIONS FOR CONCRETE AND STONE SIDEWALKS, AND FOR WALKS LAID OVER VAULTS, ETC., FROM ORDINANCE PASSED MARCH 23, 1904.

Requirements of the City as to quality of work, etc., must be observed under penalty.
Walks Laid on Filling.

Prepare foundation by cutting down or filling up to a sub-grade 14 inches below final sidewalk grade. Where filling is necessary it shall be of earth or cinders, or other material equally good, free from animal or vegetable matter, placed to leave a berme of one foot on each side of and flush with the top of the completed walk (except where the walks are laid full width of the sidewalk space), and shall slope to the natural surface $1\frac{1}{2}$ feet horizontal to 1 foot vertical. Where necessary the foundation must be compacted until solid. Soft places must be dug out and refilled and thoroughly compacted. Upon this sub-foundation lay cinders, 9 inches in depth after being flooded and thoroughly tamped. Upon this foundation place a layer of hydraulic cement concrete $4\frac{1}{4}$ inches thick, composed as follows:

Concrete Mixed with Sand.

One part of cement equal in quality to the best Portland, $2\frac{1}{2}$ parts of clean torpedo sand, ranging from $\frac{1}{8}$ inch down to the finest, and 5 parts of crushed limestone, or other stone equally as good, or washed gravel, all free from dust and dirt or other foreign substances, and not less than $\frac{1}{4}$ inch or more than 1 inch in any dimension. The cement and sand shall be thoroughly mixed dry, after which it shall be moistened with water and made into a stiff mortar. The crushed stone or gravel to be sprinkled with water, then incorporated in the mortar and the mass thoroughly mixed by turning over with shovels, hoes, or mixers at least three times, and then placed on the foundation and rammed until solid.

The finishing layer, $\frac{3}{4}$ of an inch thick, 2 parts of cement equal in quality to the best Portland and 3 parts clean torpedo gravel or granite screenings put on before the first layer has set, and troweled to give the walk a smooth, even and glossy surface.

Space at Curb: A space of $1\frac{1}{2}$ inches between all walks and the curb at street and alley intersections.

All mixing to be done on water-tight platforms.

All work on 5, 6, 10, 12, 15, 18, 20, 24 and 25 foot walks to be laid out in blocks 5 feet by 6 feet in size; on all other widths the stones to be uniform and to have a surface of not less than 24 square feet nor more than 36 square feet.

All walks to be laid on a line 1 foot from and parallel with the lot line unless ordered by special ordinance.

WALKS LAID OVER VAULTS, ETC.

Beam Work.

Substructure: Steel I beams set not more than 5 feet centers, the outer end to rest 8 inches on curb wall and be firmly bedded in masonry to the top flange. Where practicable the inner end of beam to penetrate the building wall 6 inches. Whenever beams rest on an area wall, and the clear span between bearing points exceeds 9 feet, wall must not be less than 12 inches thick.

Where no area or building wall exists cross beams shall rest on or be framed into a girder beam and fastened to same with proper angles and thoroughly bolted or riveted. All intersecting or girder beams to be 1 inch deeper than the cross beams, which are to rest on or be framed into them.

Said girder beams to be supported by circular cast iron columns, not more than $8\frac{1}{2}$ feet apart from centers, and not less than 5 inches external diameter and metal not less than $\frac{1}{2}$ inch thick, free from blow-holes and defects.

Columns to rest on 12 by 12 inch iron plates 1 inch thick, firmly bedded in a concrete foundation not less than 18 inches thick and having a surface bearing not less than 4 square feet. The top of column shall have a square plate 1 inch thick, fitted

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with a shoe formed in same, in which the girder beam shall rest. Columns over 10 feet to be $\frac{3}{4}$ inch metal, and 6 inches external diameter.

The top of the completed iron substructure shall be parallel with and 4 inches below top of finished walk.

The following sized steel cross beams shall be used:

Span in Feet.	Beams Deep in Inches.	Weight per Ft., lbs.
6 and 7	6	12 $\frac{1}{4}$
8	7	15
9 and 10	8	17 $\frac{3}{4}$
11 and 12	9	21 to 25
13	10	25
14, 15 and 16	12	31 $\frac{1}{2}$
17 and 18	12	40
19 and 20	15	42

If necessary to change spacing between beams or use a beam of different depth than specified, the spacing shall be so changed, or such beam shall be of sufficient weight to give it bearing strength equal to the beam specified.

Concreting: Between the beams set in place and securely fastened to the lower flange, shall be placed temporary centers, smooth on the upper surface, which shall be removed when the concrete is set, the top or crown of same shall be two inches below the top of the steel cross beams.

Upon the above forms shall be placed the concrete, composed of the same kind of material, in the same proportions, etc., as the concrete specified for sidewalks, especial care being given to tamping and ramming, and brought to a grade three inches above the top of the steel substructure and 1 inch below and parallel with the top of the completed walk. The finishing layer, 1 inch thick, composed of two parts of cement, equal in quality to the best Portland, and 3 parts screened torpedo gravel, or granite screenings, to be put on before the first layer has set, and troweled sufficiently to give the walk a smooth, even and glossy surface, joints to be formed over the center of each I beam in the concrete as well as in the top dressing, and extend over the curbing down to the pavement.

Any system or method of vault construction equal to the above system may be used in lieu thereof, but in all cases any plans calling for beams or a construction of a size or character different from the above sizes and weights must be submitted to the Commissioner of Public Works for approval before construction is commenced and must be capable of sustaining a distributed safe load of 300 pounds per square foot, including weight of walk.

A stamp or plate giving the name and address of the contractor or person building the walk and the year in which the work was done. The top of said plate or stamp must not cover more than 54 square inches of surface, shall be flush and even with the top of the finished walk and must be of a permanent character.

Wherever one contractor or person has laid walks in front of three or more adjoining lots in one stretch, one of the stamps placed at each end of stretch of walk will be sufficient.

Slope: All sidewalks to be so constructed that the grade shall be a uniform incline, with a fall of 1 inch in every 3 feet.

Curbage: The curbage shall have a top dressing 1 inch thick, and shall extend 4 inches below the top of the pavement. When finished it shall present a true and perfectly plumb appearance; all joints to be straight and clean cut.

Driveways shall conform to the sidewalk grade and shall be 9 inches in depth, consisting of a layer of concrete 7 inches in depth and a finishing layer of 2 inches. Work to be as specified for Portland concrete walks.

Stone Sidewalks shall be constructed of the best quality of limestone, quarried a sufficient time to be seasoned and thoroughly frost proof. Stone to be free from cracks, etc., sawed or planed, with full joints grooved for $1\frac{1}{4} \times \frac{3}{8}$ inch iron bars, the ends to be full and heads dressed to a uniform thickness. No stone to be less than $4\frac{1}{2}$ feet wide and of the following thicknesses:

For walks 8 feet wide the stone shall be not less than 6 inches thick.
 For walks 10 feet wide the stone shall be not less than 8 inches thick.
 For walks 12 feet wide the stone shall be not less than 10 inches thick.
 For walks 14 feet wide the stone shall be not less than 12 inches thick.
 For walks 16 feet wide the stone shall be not less than 14 inches thick.

Stones to be bedded on the curb wall on the outside and inside on 6x8 inch iron lintels of $1\frac{1}{4}$ inch metal, supported by circular cast iron columns not less than 8 feet in length set not more than 8 feet apart from centers; on foundation of stone

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not less than 12 inches deep, and having a surface bearing of not less than 4 square feet. Columns to be of the best quality of cast iron, free from all defects, of the following sizes external diameter:

For walks 8 feet wide or less 4 inch columns of $\frac{1}{2}$ inch metal.

For walks 10 feet wide or less 5 inch columns of $\frac{1}{2}$ inch metal.

For walks 12 feet and over 6 inch columns of $\frac{1}{2}$ inch metal.

Columns over 10 feet in length shall be of $\frac{3}{4}$ inch metal and 1 inch greater in external diameter than the sizes specified above.

All joints in the walk to be made water tight by caulking with oakum and pitch.

Slope: All sidewalks to be so constructed that the top surface shall coincide with the grade of the space between the curb line and the street line, which grade shall be a uniform incline from the street line toward the curb line, with a fall of 1 inch in every 3 feet.

BOILER (STEAM) AND SMOKE INSPECTION DEPARTMENT.

AN ORDINANCE

As amended February 8, 1904.

Creating a Department for the Inspection of Steam Boilers and Steam Plants.

Be it ordained by the City Council of the City of Chicago:

Section 1—Department Created—Chief Inspector: There is hereby created a department for the inspection of steam boilers and steam plants, the head of which shall be known as the Chief Inspector of Steam Boilers and Steam Plants, who shall hold office for a term of two (2) years and until his successor shall be appointed and qualified.

Sec. 2—Appointment: He shall be appointed by the Mayor subject to confirmation by the City Council.

Sec. 3—Qualification: The person so appointed shall be well qualified from practical experience in the design or construction and operation of boilers, generators, and superheaters, and their appurtenances, used for generating steam for power, steaming or heating purposes, to enable him to judge of their safety for use as such. No person employed in the department created by this ordinance shall be directly or indirectly interested in the manufacture, ownership, or agency of steam boilers or other apparatus or appliances used in the generation or use of steam, which are to be inspected.

Sec. 4—Bond: Said Chief Inspector of Steam Boilers and Steam Plants, before entering upon the duties of his office, shall execute a bond to the City of Chicago in the sum of five thousand dollars (\$5,000) with two or more sureties to be approved by the Mayor, conditioned for the faithful performance of the duties of his office.

Sec. 5—Supervising Mechanical Engineer: There is hereby created the office of Supervising Mechanical Engineer and Chief Deputy Inspector of Steam Boilers and Steam Plants, who shall be appointed by the Chief Inspector of Steam Boilers and Steam Plants from the eligible list to be prepared in accordance with the Civil Service Act and the rules of the Civil Service Commission.

Sec. 6—Bond: Said Supervising Mechanical Engineer and Chief Deputy Inspector of Steam Boilers and Steam Plants, before entering upon the duties of his office, shall execute a bond to the City of Chicago in the sum of five thousand dollars (\$5,000), with two or more sureties to be approved by the Comptroller, conditioned for the faithful performance of the duties of his office.

Sec. 7—Chief Smoke Inspector: There shall be a Chief Smoke Inspector, who shall be appointed by the Chief Inspector of Steam Boilers and Steam Plants from an eligible list prepared in accordance with the Civil Service Act, and the rules of the Civil Service Commission.

Said Chief Smoke Inspector, before entering upon the duties of his office, shall execute a bond to the City of Chicago in the sum of five thousand dollars (\$5,000), with two or more sureties to be approved by the Comptroller, conditioned for the faithful performance of the duties of his office.

Sec. 8—Board of Inspectors of Steam Boilers and Steam Plants: The said Chief Inspector of Steam Boilers and Steam Plants, Supervising Mechanical Engineer and Deputy Inspector of Steam Boilers and Steam Plants, and Chief Smoke Inspector shall

constitute the Board of Inspectors of Steam Boilers and Steam Plants. The Chief Inspector of Steam Boilers and Steam Plants shall be Chairman of said Board, and the Supervising Mechanical Engineer and Chief Deputy Inspector of Steam Boilers and Steam Plants shall be Secretary of said Board. Any two members of said Board shall constitute a quorum. Said Board shall have the same power over all steam boilers and steam plants owned or operated by the City of Chicago, or the Board of Education, as over all other steam boilers and steam plants in said City of Chicago; and all steam boilers and steam plants owned, operated, or controlled by the City of Chicago, or Board of Education of said City, shall be subject to the requirements of this ordinance; and it shall be the duty of said Board of Inspectors of Steam Boilers and steam plants to inspect at least once in each year all of such steam boilers and steam plants as are owned, operated, or controlled by the City of Chicago, or by said Board of Education, and also to preserve a record of the condition of such steam boilers or steam plants as shown by such inspection. And no fee shall be charged or paid to said department nor to any employee under said department, for the inspection of any steam boiler or steam plant or for the certificate of inspection issued by said department for any steam boiler or steam plant owned, operated, or controlled by said City of Chicago or said Board of Education.

Sec. 9—Duties of the Board: It shall be the duty of the Board to inspect all boilers, tanks, jacket kettles, generators or other apparatus used for generating or transmitting steam for power, or using steam under pressure for heating or steaming purposes, and all other tanks, jacket kettles and reservoirs under pressure of whatsoever kind, except as hereinafter provided, as often as once in each and every year, by making a hydrostatic pressure test where such tests shall be deemed necessary; provided, that the hydrostatic pressure used in such test shall not exceed the maximum working pressure of said apparatus by more than fifty per cent; and by making a careful external and internal examination. In all cases where hydrostatic pressure test is used an internal examination of said apparatus shall afterwards be made. In certifying the working pressure allowed on each steam boiler, steam generator or other apparatus the same shall be determined by multiplying one-fifth of the lowest tensile strength of any plate in the cylindrical shell of said steam boiler or steam generator or other apparatus by the lowest efficiency of joint in such cylindrical shell expressed in decimals, and by multiplying the product by the thickness, expressed in inches or parts of an inch, of the thinnest plate in the same cylindrical shell and divide by the radius, also expressed in inches. This sum will be the pressure allowable per square inch of surface.

Any boiler, tank, jacket kettle, generator or reservoir having been in use eight years or more and its condition being such that in the opinion of the inspector the same should be drilled in order that the exact thickness and condition may be ascertained, he shall report the same to the Chief Inspector of Steam Boilers, who shall serve the owner or agent with a written notice to show cause to the Chief Inspector within five days why such boiler, tank, jacket kettle, generator or reservoir should not be drilled.

If, after the owner or agent has been heard, or at the end of five days, the Chief Inspector deems it necessary that the boiler, tank, jacket kettle, generator or reservoir be drilled, then the boiler, tank, jacket kettle, generator or reservoir may be drilled at points near the water line, and at the bottom of shell of boiler, or such other points in the boiler, tank, jacket kettle, generator or reservoir as the inspecting officer may direct, and the thickness of said material shall be determined thereafter at such annual inspection as the inspecting officer may deem necessary, and the steam pressure or other pressure allowed shall be governed by such ascertained thickness and general condition of boiler, jacket kettle, generator or reservoir. And the drilling and plugging of said holes shall be done at the expense of the owner.

Any boiler may be tested and rated in accordance with the United States Marine Inspection Law governing the inspection of steam boilers. But no boiler, tank, jacket kettle or jacket constructed or re-constructed of boiler plates hereafter, where the same are required, shall have stay bolts of less than seven-eighths of an inch in diameter and pitched more than seven inches apart. And all stationary boilers, tanks, jacket kettles or jackets carrying a pressure of one hundred pounds or over to the square inch, the construction of which requires stay bolts shall be equipped with hollow stay bolts. All boiler heads made of boiler plate shall be braced with braces, the sectional area of which shall not be less than one square inch each, so pitched that a greater strain than six thousand pounds per square inch of section shall not be carried by any one brace or stay bolt. In computing the strain on braces in flat surfaces the diameter of brace rivets shall be considered. In computing the strain on shells having dished heads the pressure will be figured according to the radius of the heads.

Sec. 10—The emission of dense smoke from the smoke-stack of any boat or locomotive, or from any chimney anywhere within the city, shall be deemed, and is hereby

declared to be, a public nuisance, but no prosecution for the emission of dense smoke shall be commenced, unless within ten days prior thereto at least three notices shall have been mailed to the offender that dense smoke has been seen emitted from his premises.

The owner or owners, lessee, agent, or manager of any boat or locomotive, and the proprietor, lessee, or agent of any building, factory, mill, works, or other establishment having smoke-stacks or chimneys, who shall permit or allow dense smoke to issue or to be emitted from the smoke-stack of any such boat or locomotive, or the chimney of any building, factory, mill, works, or other establishment having smoke-stacks or chimneys within the corporate limits to exceed three minutes (excepting in cases where the fire box is being cleaned out or new fire built therein, in which cases the limit shall be six minutes), in any hour of the day or night, shall be deemed and held guilty of creating a nuisance, and shall for every such offense be fined a sum of not less than ten dollars (\$10) nor more than one hundred dollars (\$100).

It shall be the duty of the Board to see that the boiler or boilers, boiler setting, means of producing draft, smoke connections, and furnace or fire-box of each boiler inspected by it are of sufficient capacity and so constructed as with proper management to avoid the emission of dense smoke.

Prosecutions for all violations of this ordinance by persons allowing dense smoke to issue from any chimney shall be brought by the Chief Smoke Inspector, and the prosecutions for all other violations of this ordinance shall be brought by the Chief Inspector or Supervising Mechanical Engineer and Chief Deputy Inspector of Steam Boilers and Steam Pipes, in the name of the City of Chicago.

Provided, that no prosecution under this ordinance shall be commenced against the owner, or owners, lessee, agent or manager of any boat, locomotive, or the proprietor, lessee or agent of any building, factory, mill, works or other establishment having smoke stacks or chimneys, the plant of which shall have been installed prior to the passage of this ordinance, until the expiration of one year after the passage of this ordinance, within which to rebuild and re-equip the same in accordance with the provisions of this ordinance; Provided, further, that no such owner, owners, lessee, agent or manager shall be entitled to said one year unless he shall at once commence his plans for the rebuilding and re-equipping of such plant and shall proceed with said work to the satisfaction of the Board upon inspection at intervals of three months during said period of one year.

Sec. 11—Permit for New Plants: From and after the passage of this ordinance, no new plants, nor any reconstruction of any old plants, for producing power and heat, or either of them, nor any new chimney connected with a steam plant, shall be erected or maintained in the City of Chicago until the plans and specifications of the same have been filed in the office of and approved by the said Board, which plans and specifications shall show the amount of work and the amount of heating to be done by said plant and all the appurtenances thereto, including provisions for the complete combustion of the fuel to be used and for the prevention of smoke, and a statement of the kind of fuel proposed to be used. Said plans and specifications shall also show that the room or apartment in which said plant shall be located is provided with doors, windows, air-shaft, fans, and other means of ventilation sufficient to prevent the temperature of such room, apartment, basement, or other portion of such building wherein said steam plant or apparatus is to be used, from rising to a point higher than one hundred and twenty (120) degrees Fahrenheit, or that the atmosphere of any such apartment wherein such apparatus may be located may be entirely renewed every ten minutes. Upon approval of said plans and specifications, a duplicate set of which shall be left on file in said office, and the payment of fees as hereinafter provided, said Board shall issue a permit for the installation of said plant or said reconstruction. Said permit shall state the maximum amount of steam pressure to be carried. As soon as the Board hereby created has examined the plans and specifications submitted for a new steam plant in a new building and has issued a permit for the installation of same, it shall notify the Commissioner of Buildings to see that the execution of the construction work on the building in which such plant is to be installed is carried out in conformity with the plans and specifications of the proposed steam plant for the execution of which a permit has been issued, with special reference to the amount of space to be used for such appurtenances, the size and construction of the chimney or chimneys to be used, and the provisions for ventilation and proper temperature in the engine and boiler rooms.

It shall be the duty of the Supervising Mechanical Engineer and Chief Deputy Inspector of Steam Boilers and Steam Plants to examine in detail all plans and specifications that may be submitted to the Board, and to report upon the same for approval by the Board. All permits shall be issued by an affirmative vote of a majority of the Board.

Sec. 12—Duty of Owners: It shall be unlawful for any person to use any steam boiler or any tank or tanks subject to pressure other than City pressure, until he shall have first procured a certificate from said Board that said apparatus may be

safely used, and that the boiler or boilers, boiler setting, means of producing draft, smoke connections, and furnace or fire-box are of such size and capacity that they will do the work required, and be capable of being so managed for the purpose of generating steam that no dense smoke shall be emitted from the chimney connected with such furnace or fire-box.

If such owner, agent or person using a steam boiler or tank shall fail to notify said Board of his intention to make any alteration, repairs or enlargement of such steam plant, and shall fail to file plans and specifications for the enlargement or alterations of the same, and shall proceed to make such alterations, repairs or enlargement without a permit therefor, he shall be liable to a fine of twenty-five dollars (\$25.00) for each day on which he shall have prosecuted such alteration, repairs or enlargement without said permit, and each day's violation shall constitute a separate offense. Provided, however, that minor necessary or emergency repairs which do not increase the capacity of said apparatus or involve any substantial alteration of structure may be made by or under the engineer in charge of said apparatus without permit or report thereof.

If at any time when inspecting a steam boiler, generator or other apparatus used for generating steam for power or heating purposes the Inspector of Boilers shall find that the furnace or fire-box in which fuel is used for the purpose of generating steam is so constructed or operated as to cause the emission of dense smoke from the chimney connected therewith he shall report to said Board the condition of said plant. The owner of said steam boiler, generator or apparatus shall have the right to put in such appliance or make such alterations or use such fuel as in his judgment will prevent the emission of dense smoke, but this shall not constitute a compliance with this ordinance unless such appliance or such fuel shall actually prevent the emission of dense smoke.

Provided, however, that this ordinance shall not apply to tanks, jacket kettles or reservoirs of under seventy-five gallons capacity, hot water tanks used for domestic purposes, boilers on locomotives or boilers, generators or other apparatus used in private residences for generating steam solely for heating purposes; and for the purpose of this ordinance flat buildings or apartment buildings with more than three apartments shall not be classed as private residences, and any steam boiler, generator or other apparatus carrying other than City pressure in flat buildings or apartment buildings having more than three flats or apartments shall be subject to inspection as hereinbefore provided.

Provided, also, that any boilers for heating purposes only, in which the permit specifies that not more than ten pounds of steam pressure to the square inch shall be carried, shall be known as "low pressure boilers."

After the next inspection of such boilers shall have been made following the adoption of this ordinance, inspections thereafter shall be made once in every three years. But all of such low-pressure plants may be inspected at any time thereafter, and without charge, with reference to the provisions for draft, complete combustion or degree of combustion of fuel and prevention of the emission of smoke.

Sec. 13—Certificate—Record: When an inspection of a boiler or boilers, tank or tanks, jacket-kettle, generator or generators, superheater or superheaters, or any apparatus under pressure, has been made, and the same shall be approved by the Chief Inspector or Supervising Mechanical Engineer and Chief Deputy Inspector of Steam Boilers and Steam Plants, he shall make and deliver to the person for whom the inspection was made, upon the payment of the fees hereinafter mentioned, a certificate of such inspection, which shall contain the date of inspection, together with a general description, for what purpose used, the number of try-cocks, steam and water gauges, the pounds pressure at which they may be safely used; which certificate shall be framed and put up in a conspicuous place in the engine or boiler room, and a record of the same shall be made and kept by said Board, in a well-bound book or books, indexed alphabetically or by locality. But such certificate shall not be a waiver of liability in the case of any prosecution for the making of dense smoke.

Sec. 14—Inspection of Repairs: It shall be the duty of said Inspector, upon an application in writing made by any person, firm, corporation, or agent, owning, leasing or controlling the use of any boiler, tank, jacket-kettle, generator, or superheater, stating that the same is out of repair or has been repaired, to examine the same when so repaired, and determine if such repairing has been properly done; and it shall be unlawful for any person, firm, corporation, or agent to use any boiler, tank, jacket-kettle, generator, or superheater, after the same has been repaired, until a certificate shall have been procured from the Inspector to the effect that such repairing has been properly done, and such boiler, tank, jacket-kettle, generator, or superheater may be safely used, except as hereinbefore provided in Section 12 of this ordinance.

Sec. 15—Fees: The fees for inspection of steam boilers and other apparatus under this ordinance shall be as follows:

Class A—Including steam boilers, tanks, jacket-kettles, of a capacity of seventy-five gallons or over, generators, or other apparatus under a pressure exceeding ten pounds per square inch in plants where only one such apparatus is used, Five Dollars each.

Class B—Steam boilers, generators, or superheaters using steam under pressure exceeding ten pounds per square inch in plants where more than one such is used, five dollars for the first and three dollars for each additional apparatus.

Class C—Tanks and jacket-kettles, of a capacity of seventy-five gallons or over, under pressure in plants where more than one such tank or jacket-kettle is used, one dollar each for all after the first.

Class D—All low-pressure steam boilers as herein described in Section 12, three dollars each.

Class E—The fee for a permit for a new steam plant or for additions to an old plant shall be five dollars for each boiler installed.

All fees provided for in this ordinance shall be paid to the City Collector.

Exemptions—Charitable, Religious and Educational Institutions—Said Board may, and it is hereby directed and instructed to, remit all inspection fees charged, or that may hereafter be charged, against any and all charitable, religious, and educational institutions, when the boiler or other apparatus inspected is located in or upon premises used and occupied exclusively by such charitable, religious or educational institution: provided that such charitable, religious, or educational institution is not conducted or carried on for private gain or profit, and provided further, that said Board may require every application for the remission of such fees to be verified by the affidavit of one or more taxpayers of the City of Chicago.

Sec. 16—Charging excess fees: If any person shall take or receive any money or any valuable thing from any person for the purpose of deceiving or defrauding any person or persons, or for the purpose of favoring any person or persons, or if any inspector shall recommend the issue of any certificate of inspection without having at the time stated thoroughly examined and tested the boiler so certified, he shall be liable to a fine in the penal sum of one hundred dollars (\$100), and his action shall be immediately reported by said Board to the Civil Service Commissioners.

Sec. 17—Trycocks, Gauges, Force Pumps: It shall be the duty of every person, firm, corporation, or agent, owning, leasing, or controlling the use of any steam boiler or boilers, subject to inspection, as hereinbefore provided, to provide and properly affix to each and every one of such boilers a full complement of try-cocks, one water gauge, one fusible plug of good Banca tin, one or more pop safety valves (the area of pop valves shall be in the ratio of one square inch to three square feet of grate surface): Provided, that on boilers used for generating steam for heating purposes only and carrying not more than ten (10) pounds steam pressure, direct weighted safety valves may be used. On each steam boiler or steam generator, or other apparatus subject to inspection, there shall be placed a suitable shut-off or main stop valve so placed as to prevent the water passing into the heating apparatus during the test made at the time of inspection; provided that shut-off or main stop valves shall be required only in plants to be hereafter installed, and a good and sufficient force pump or other means of supplying the boiler with water; also a good and sufficient safety valve or reducing valve to all tanks or jacket-kettles, properly attached. No stop or shut-off valve shall be placed between a boiler, tank, or jacket-kettle and the safety valve.

After inspection the Inspector shall seal all safety valves, and said seal shall not be broken except by authority of said Board, except in case of emergency, and when the seal is broken a complete report of the same shall be made to said Board within twenty-four (24) hours; said valve shall be resealed forthwith by said Board without charge, provided the circumstances of the breaking of such seal are approved by said Board.

Sec. 18—Owners to Provide Facilities: All owners, agents, or other person using steam boilers, tanks, jacket-kettles, generators, or superheaters, subject to inspection as aforesaid, shall provide at their own expense such arrangements and facilities for attaching the instruments of inspection as the Inspector shall require. Immediately before the time set for such inspection, all such owners and persons shall remove all scale, dirt, soot, and sediment in, beneath, and around said boiler, shall fill the same with water, when so directed by the Inspector, and have all main stop valves and other valves and connections on said boiler or boilers perfectly tight, so that the Inspector may be able to apply hydrostatic pressure, leaving all said apparatus in clean condition for inspection.

Sec. 19—Engineer's Negligence, Maximum Pressure, and Safety Valves: Any engineer or other person in charge of a steam boiler or generator who shall negligently or wrongfully endanger the life of any person by permitting the water to fall below three inches above the flues or crown sheet of any boiler, or shall disturb the spring or weight on the safety valve, or break the seal of the safety valve, or tamper with it so

as to carry more pressure than allowed by the Inspector, or who shall otherwise neglect his duties, shall be subject to a fine of not less than \$25 nor more than \$100, and it shall be the duty of the Chief Inspector to report the facts to the Board of Examining Engineers.

The safety valves of steam boilers shall not be loaded to sustain more than the maximum pressure allowed by said Inspector, and the area of the discharge of each safety valve shall be equal to the full area of the valve, and all safety valves shall be directly open to the atmosphere.

Sec. 20—Manufacturers and Dealers—Notify Inspectors: Any person, company, or agent manufacturing, dealing in, selling, or erecting steam boilers, tanks, jacket-kettles, or generators, subject to inspection under this ordinance, shall, on the sale or delivery of such steam boiler, tank, jacket-kettle, or generator at any point or locality within the city, notify the said Board, giving the name of the owner, name of maker, number and name of street, or otherwise designate the locality of said delivery or sale; shall state also the thickness and quality of the material used in the construction and the brand stamped on the plate.

Sec. 21—Second-Hand Dealers: All steam boiler manufacturers, second-hand steam boiler and junk dealers, and any other person or persons selling second-hand steam boilers, tanks, jacket-kettles, generators, or superheaters, must, before painting the same, have them inspected by the Department of Steam Boilers and Steam Plants, and have in their possession a certificate issued by said Department, showing the amount of pressure per square inch the said steam boiler, tank, jacket-kettle, generator or superheater is allowed to carry before offering for sale any second-hand steam boiler, tank, or jacket-kettle, generator, or superheater, and give the buyer the said certificate of inspection. Any person or persons, firm, or corporation violating this section shall be liable to a fine of not less than ten dollars (\$10), nor more than one hundred dollars (\$100), for each and every offense.

Provided that any person or persons disposing of a second-hand steam boiler, tank, jacket-kettle, generator, or superheater, which has been in use, shall not be required to secure inspection if said steam boiler, tank, jacket-kettle, generator, or superheater is sold to a dealer in or repairer of such apparatus, but such inspection shall be had before such articles are sold for use.

Sec. 22—Penalty: Any owner, agent, or user of steam boilers, or other person, who shall violate any of the provisions of this ordinance, where no other penalty is provided, shall be subject to a penalty of not less than twenty-five (\$25), nor exceeding one hundred dollars (\$100), for each and every offense.

Sec. 23—Apparatus: The City of Chicago shall provide such instruments, books, papers, and equipment as shall be necessary for the proper performance of the duties of such Board, which shall be the property of said City, and which shall be delivered by said Board to its successors in office. Said Board shall report annually to the Mayor and City Council, or as often as required by said Council.

Said Board shall prepare and keep in its office a record of each steam boiler, steam generator, tank, jacket-kettle, or other apparatus used for the generation of steam or under pressure other than City pressure, and at the first inspection of any such apparatus under and by virtue of this ordinance a number shall be securely stamped upon the same with a steel stamp or die, of not less than one-half inch in height, in a conspicuous and easily accessible place upon said apparatus, which number shall be the office number of such piece of apparatus, and the designation by which the same shall be known in said record after such inspection; and said record shall contain a full description of such piece of apparatus, together with the use for which it is employed, the place where it may be located, the name of the owner, agent, or lessee of said apparatus, together with the amount of pressure allowed by the Inspector for the same, and the kind of fuel used, together with the number of trycocks, steam and water gauges, and any special information pertaining thereto, including a record of inspections made.

Sec. 24—Salaries: The salary of the Chief Inspector of Steam Boilers and Steam Plants shall be \$3,600 per annum, that of the Supervising Mechanical Engineer and Chief Deputy Inspector of Steam Boilers and Steam Plants \$3,600 per annum, and that of Smoke Inspector of Steam Boilers and Steam Plants \$2,000 per annum. There shall be appointed in addition to the above named officials a Chief Clerk and such other assistants, inspectors and employes as the City Council may by ordinance prescribe and establish. It will be the duty of the Assistant Inspectors to report defects in furnaces and smoke-stacks as well as in boilers, and it shall be the special duty of the Deputy Smoke Inspectors to report dense smoke emitted from chimneys, together with the probable causes therefor, determined by them on investigation of the plants connected with such chimneys.

Section 25—This ordinance shall take effect May 1, 1903. On that day the Inspector of Steam Boilers, for the time being, shall turn over to the Board hereby established all the books, accounts and property of the City of Chicago in his charge and possession, and close up his accounts with the City Comptroller, and the Commissioner of Health shall transfer to the Board hereby created all the books and accounts of the Smoke Inspector.

Sec. 26. Upon the passage and approval of this ordinance a copy of the same shall be mailed by the Department so created to all users of steam power coming within the Department's jurisdiction, within ninety days after the passage of the same.

Sec. 27. Sections 1046, 1047 and 1048, and Sections 1936 to 1939 inclusive, and Section 1952 of the Revised Code of the City of Chicago of 1897 and an ordinance passed by the City Council December 29, 1897, relating to the office of Boiler Inspector, and all orders and ordinances amending and affecting said sections and said ordinance of December 29, 1897, are hereby repealed; provided, that this section shall not affect or operate to discontinue, discharge, or abate any suit or suits heretofore commenced by the City of Chicago, under any of said sections of the Revised Code of the City of Chicago or under said ordinance of December 29, 1897, and which suit or suits shall be in any wise pending in any court at the time this ordinance takes effect; but said sections of said Revised Code of Chicago and said ordinance of December 29, 1897, shall continue and be in full force and effect so far as said cases so pending are concerned.

MECHANICS' LIEN LAW.

MECHANICS' LIEN LAW—APPROVED MAY 18, 1903.

An Act to revise the law in relation to mechanics' liens. To whom, what for, and when lien is given; who is a contractor; area covered by and extent of lien; when the lien attaches.

Section 1. Be it enacted by the People of the State of Illinois, represented in the General Assembly: That any person who shall by any contract or contracts, expressed or implied, or partly expressed and partly implied, with the owner of a lot or tract of land, or with one whom such owner has authorized or knowingly permitted to contract for the improvement of, or to improve the same, furnish material, fixtures, apparatus or machinery for the purpose of, or in the building, altering, repairing or ornamenting any house or other building, walk or sidewalk, whether such walk or sidewalk be on the land bordering thereon, driveway, fence or improvement, or appurtenance thereto on such lot or tract of land, or connected therewith, and upon, over or under a sidewalk, street or alley adjoining; or fill, sod or excavate such lot or tract of land, or do landscape work thereon or therefor; or raise or lower any house thereon, or remove any house thereto, or perform services as an architect for any such purpose, or furnish or perform labor or services as superintendent, timekeeper, mechanic, laborer or otherwise, in the building, altering, repairing or ornamenting of the same; or furnish materials, fixtures, apparatus, machinery, labor or services on the order of his agent, architect or superintendent having charge of the improvements, building, altering, repairing or ornamenting the same, shall be known under this act as a contractor, and shall have a lien upon the whole of such lot or tract of land and upon the adjoining or adjacent lots or tracts of land of such owner constituting the same premises and occupied or used in connection with such lot or tract of land as a place of residence or business; and in case the contract relates to two or more buildings, on two or more lots or tracts of land, upon all of such lots and tracts of land and improvements thereon for the amount due to him from such material, fixtures, apparatus, machinery, services or labor, and interest from the date the same is due. This lien shall extend to an estate in fee, for life, for years, or any other estate, or any right of redemption, or other interest which such owner may have in the lot or tract of land at the time of making such contract or may subsequently acquire therein, and shall be superior to any right of dower of husband or wife in said premises, provided the owner of such dower interest had knowledge of such improvement and did not give written notice of his or her objection to such improvement before the making thereof; nor shall the taking of additional security by the contractor or sub-contractor be a waiver of any right of lien which he may have by virtue of this act, unless made a waiver by express agreement of the parties; and this lien shall attach as of the date of the contract.

Sec. 2. Liens for work or materials by mistake put upon land other than the contracting owners. Any person furnishing services, labor or material for the erection of a building, or structure, or improvement, by mistake upon land owned by another than

the party contracting as owner, shall have a lien for such services, labor or material upon such building, or structure or improvement, and the court, in the enforcement of such lien, shall order and direct such building, structure or improvement to be separately sold under its decree, and the purchaser may remove the same within such reasonable time as the court may fix.

Sec. 3. Liens for work or materials under contract of husband on land of wife. If any such services or labor are performed upon or materials are furnished for lands belonging to any married woman, with her knowledge and not against her protest in writing as provided in section 1 of this act, in pursuance of a contract with the husband of such married woman, the person furnishing such labor or materials shall have a lien upon such property, the same as if such contract had been made with married woman, and in case the title to such lands upon which improvements are made is held by husband and wife jointly, the lien given by this act shall attach to such lands and improvements, if the improvements be made in pursuance to a contract with both of them, or in pursuance of a contract with either of them, and in all such cases no claim of homestead right set up by a husband or wife shall defeat the lien given by this act.

Sec. 4. Breach of contract by owner; recovery for material; partial performance; quantum meruit; right to reclaim unused material. When the owner of the land shall fail to pay the contractor moneys justly due him under the contract at the time when the same should be paid, or fails to perform his part of the contract in any other manner, the contractor may discontinue work, and the contractor shall not be held liable for any delay on his part during the period of, or caused by, such breach of contract on the part of the owner; and if after such breach for the period of ten days the owner shall fail to comply with his contract, the contractor may abandon the work, and in such a case the contractor shall be entitled to enforce his lien for the value of what has been done, and the court shall adjust his claim and allow him a lien accordingly. In such cases all persons furnishing material which has not been incorporated in the improvement shall have the right to take possession of and remove the same if he so elects.

Sec. 5. Contractor to notify owner of sub-contracts and amount of their claims; owner's duty with regard thereto and rights in case of default; contractor's liability for failure to give statement; contractors to whom this section does not apply. It shall be the duty of the contractor to give the owner, and the duty of the owner to require of the contractor, before the owner or his agent, architect or superintendent, shall pay or cause to be paid to said contractor or to his order any moneys or other consideration, due or to become due such contractor, or make or cause to be made to such contractor any advancement of any moneys or any other consideration, a statement in writing, under oath or verified by affidavit, of the names of all parties furnishing materials and labor, and of the amounts due or to become due each. Merchants and dealers in materials only shall not be required to make statements herein provided for.

Sec. 6. Time for completion of contract. In no event shall it be necessary to fix or stipulate in any contract a time for the completion of a time payment in order to obtain a lien under this act, provided, that the work is done or material furnished within three years from the commencement of said work or the commencement of furnishing said material.

Sec. 7. Limitation as against third parties; claim for lien; what shall consist of; when claim may be filed and when amended; as to errors in; proof of delivery of material, not use, sufficient; delivery of material at one building good for all buildings. No contractor shall be allowed to enforce such lien against or to the prejudice of any other creditor or incumbrancer or purchaser, unless within four months after completion, or if extra or additional work is done or material is delivered therefor within four months after the completion of such extra or additional work or the final delivery of such extra or additional material, he shall either bring suit to enforce his lien therefor or shall file with the clerk of the circuit court in the county in which the building, erection or other improvement to be charged with the lien is situated, a claim or lien, verified by the affidavit of himself, or his agent or employe, which shall consist of a brief statement of the contract, the balance due after allowing all credits, and a sufficiently correct description of the lot, lots or tracts of land to identify the same. Such claim for lien may be filed at any time after the contract is made, and as to the owner may be filed at any time after the contract is made and within two years after the completion of said contract, or the completion of any extra work or the furnishing of any extra material thereunder, and as to such owner may be amended at any time before the final decree. No such lien shall be defeated to the proper amount thereof because of an error or overcharging on the part of any person claiming a lien therefor under this act, unless it shall be shown that such error or overcharge is made with intent to defraud; nor shall any such lien for material be defeated because of lack of proof that the material after the delivery thereof, actually entered into the construction of such building or improvement, although it be shown that such material was not actually used in the construction of such building or improvement. Provided, it is

shown that such material was delivered either to such owner or his agent for such building or improvement to be used in such building or improvement, or at the place where said building or improvement was being constructed, for the purpose of being used in construction. And provided, further, that in case of the construction of a number of buildings under contract between the same parties, it shall be sufficient in order to establish such lien for material, if it be shown that such material was in good faith delivered at one of the said buildings for the purpose of being used in the construction of any one or all of such buildings, or delivered to the owner or his agent for such buildings, to be used therein; and such lien for such material shall attach to all of said buildings, together with the land upon which the same are being constructed, the same as in a single building or improvement. And provided, further, that in the event that the contract relates to two or more buildings on two or more lots or tracts of land, then all of said buildings and lots or tracts of land may be included in one statement of claim for a lien.

Sec. 8. Assignability of liens or claims for lien; rights of assignee. All liens or claims for lien which may arise or accrue under the terms of this act shall be assignable, and proceedings to enforce such liens or claims for lien may be maintained by and in the name of the assignee, who shall have as full and complete power to enforce the same as if such proceedings were taken under the provisions of this act by and in the name of the lien claimant.

Sec. 9. When, how and in what court suit may be brought; two or more lien holders may join in bringing suit; answers stand as cross-bills; original bill cannot be dismissed without consent of parties; lien claimants may contest each other's claims without formal issues of record; rights of in case of surprise; limitation. If payment shall not be made to the contractor having a lien by virtue of this act of any amount due when the same becomes due, then such contractor may bring suit to enforce his lien by bill or petition in any court of competent chancery jurisdiction in the county where the improvement is located, and in the event that the contract relates to two or more buildings or two or more lots or tracts of land, then all of said buildings and lots or tracts of land may be included in one bill or petition. Any two or more persons having liens on the same property may join in bringing such suit, setting forth their respective rights in their bill or petition; all lien claimants not made parties thereto may upon application become defendants and enforce their liens by answer to the bill or petition in the nature of an intervening petition, and the same shall be taken as a cross-bill against all the parties to such suit; and the said bill or petition shall not thereafter be dismissed as to any such lien claimant, or as to the owner or owners of the premises without the consent of such lien claimant. The complainant or petitioner, and all defendants to such bill or petition may contest each other's right without any formal issue of record made up between them other than that upon the original bill or petition, as well with respect to the amount due as to the right to the benefit of the lien claimed: Provided, that if by such contest by co-defendants any lien claimants be taken by surprise the court may, at its discretion, as to such claim, grant a continuance. The court may render judgment against any party summoned and failing to appear, as in other cases of default. Such suit shall be commenced or answer filed within two years after the completion of the contract, or completion of the extra or additional work, or furnishing of extra or additional material thereunder.

Sec. 10. Personal representatives; death of parties in interest. Suits may be instituted under the provisions of this act in favor of administrators or executors, and may be maintained against the representatives in the interest of those against whom the cause of action accrued, and in suits instituted under the provisions of this act, the representatives of any party who may die pending the suit shall be made parties.

Sec. 11. Who are parties in interest; how and when made; or may become parties to suit. Publication, service of process on non-resident; claims not due, etc.; pleading requisites of bill or petition; diligence required in prosecuting claim; when and how party bringing suit may dismiss same. The bill or petition shall contain a brief statement of the contract or contracts on which it is founded, the dates, when made, and when completed, if not completed, why, and it shall also set forth the amount due and unpaid, a description of the premises which are subject to the lien, and such other facts as may be necessary to a full understanding of the rights of the parties. Where plans and specifications are by reference made a part of the contract it shall not be necessary to set the same out in the pleadings or as exhibits, but the same may be produced on the trial of the suit. The complainant or petitioner shall make all parties interested, of whose interest he is notified or has knowledge, parties defendant, and summons shall issue and service thereof be had as in suits in chancery; and when any defendant resides or has gone out of the State, or on inquiry cannot be found, or is concealed within this State, so that process cannot be served on him, the complainant or petitioner shall cause a notice to be given to him in like manner and upon the same conditions as is provided in suits in chancery, and his failure to so act with regard to summons or notice

shall be ground for judgment or decree against him as upon the merits. The same rule shall prevail with cross-petitioners with regard to any person of whose interest they have knowledge, and who are not already parties to the suit of action. Parties in interest, within the meaning of this act, shall include persons entitled to liens thereunder whose claims are not, as well as are, due at the time of the commencement of suit, and such claim shall be allowed subject to a reduction of interest from the date of judgment to the time the claim is due; also all persons who may have any legal or equitable claim to the whole or any part of the premises upon which a lien may be attempted to be enforced under the provisions thereof, or who are interested in the subject matter of the suit. Any such persons may, on application to the court wherein the suit is pending, be made or become parties at any time before final judgment. No action or suit under the provisions of this act shall be voluntarily dismissed by the party bringing the same without due notice to all parties before the court and leave of court upon good cause shown and upon terms named by the court.

Sec. 12. Practice; powers of court; when receivers may be appointed. The court shall permit amendments to any part of the pleadings, and may issue process, make all orders requiring parties to appear, and requiring notice to be given, that are or may be authorized in proceedings in chancery and shall have the same power and jurisdiction of the parties and subject matter, and the rules of practice and proceedings in such cases shall be the same as in other cases in chancery, except as is otherwise provided in this act. The court shall have power to appoint receivers for property on which liens are sought to be enforced in the same manner for the same causes and for the same purposes as in cases of foreclosure of mortgages, as well as to complete any unfinished building where the same is deemed to be to the best interest of all the parties interested.

Sec. 13. Practice; answer; defense; right to recover on counter claim. Defendant shall answer the bill or petition under oath, unless the oath is waived by the complainant or petitioner. The owner shall be entitled to make any defense against the contractor by way of set-off, recoupment or counter claim that he could in any action at law, and shall be entitled to the same right of recovery on proof of such in excess of the claim of the contractor against the contractor only, but for matters not growing out of the contract such recovery shall be without prejudice to the rights of the sub-contractors thereunder for payment out of the contract price or fund; and in event that the court shall find, in any proceeding in chancery, that no right to a lien exists, the contractor shall be entitled to recover against the owner as at law, and the court shall render judgment as at law for the amount which the contractor is entitled to, together with costs in the discretion of the court. In any proceedings to enforce a lien it shall only be necessary for all persons seeking a lien on account of wages due for labor to file in such proceedings an affidavit giving the amount due, between what dates the same was performed and the kind of labor performed, and the court shall direct the amount due for wages as therein specified to be paid within a short day to be fixed by the courts, unless within ten days after the filing of said claim for wages the amount claimed is contested by the owner or some other party to the suit, and in order to contest the amount due for wages it shall be necessary for the party making such contest to file an affidavit in which he shall state the defense he has to the allowance of such claim, and the court shall proceed at once to hear such evidence as the parties may adduce, and determine the merits as to the allowance of such claim for wages, and in the event that the allowance for wages is not paid within the time fixed by the court, then the court shall order the premises sold to pay such amount in such manner as the court shall direct.

Sec. 14. Trials; parties ready not to be delayed; when court may delay order for sale or distribution. In no case shall the want of preparation for trial of one claim delay the trial in respect to others, but trial shall be had upon issues between such parties as are prepared without references to issues between other parties; and when one creditor shall have obtained a decree or judgment for the amount due, the court may order a sale of the premises on which the lien operates, or a part thereof, so as to satisfy the decree or judgment: Provided, that the court may, for good cause shown, delay making any order for sale or distribution until the rights of all parties in interest are ascertained and settled by the court.

Sec. 15. Preference to laborers; no preference to first contractor. Upon all questions arising between different contractors having liens under this act, no preference shall be given to him whose contract was made first, except the claim of any person for wages by him personally performed, shall be a preferred lien.

Sec. 16. Incumbrances; apportionment; on improvements made after record of incumbrance; lien holders have no pro rata benefit in what owner pay for; fraudulent incumbrances; disposition of. No incumbrance upon land, created before or after the making of the contract under the provisions of this act, shall operate upon the building erected, or materials furnished until a lien in favor of the persons having done work

or furnished material shall have been satisfied, and upon questions arising between incumbrances and lien creditors, all previous incumbrances shall be preferred to the extent of the value of the land at the time of making of the contract, and the lien creditor shall be preferred to the value of the improvements erected on said premises, and the court shall ascertain by jury or otherwise, as the case may require, what proportion of the proceeds of any sale shall be paid to the several parties in interest. All incumbrances, whether by mortgage, judgment or otherwise, charged and shown to be fraudulent, in respect to creditors, may be set aside by the court, and the premises freed and discharged from such fraudulent incumbrance.

Sec. 17. Costs; how taxed; attorneys fees. The costs of proceedings, as between all parties to the suit, shall be taxed equitably against the losing parties, and where taxed against more than one party, shall be so taxed against all in favor of the proper party but equitably as between themselves; and the costs, as between creditors aforesaid in contests relative to each other's claims, shall be subject to the order of the court, and the same rule shall prevail in respect to costs growing out of the proceedings against and between incumbrances. In all cases where liens are enforced, the court shall, in its discretion, order a reasonable attorney's fee taxed as a part of the costs in favor of the lien creditor.

Sec. 18. What estate to be sold; manner of making sales, when part may be sold. Whatever right or estate such owner had in the land at the time of making the contract may be sold in the same manner as other sales of real estate are made under decrees in chancery. If any part of the premises can be separated from the residue, and sold without damage to the whole, and if the value thereof is sufficient to satisfy all the claims proved in the cause, the court may order a sale of that part.

Sec. 19. Proceeds of sale; application of pro rata; labor claims preferred; deficiency decrees; excess, to whom paid. The court shall ascertain the amount due each lien creditor and shall direct the application of the proceeds of sale to be made to each in proportion to their several amounts, according to the provisions of this act, but the claims of all persons for labor as provided in section fifteen (15) shall be first paid. If, upon making sale under this act of any or all premises, the proceeds of such sale shall not be sufficient to pay all claims of all parties, according to their rights, the decree shall be credited by the amount of said sale and execution may issue in favor of any creditor whose claims are not satisfied for the balance due as upon a deficiency decree in the foreclosure of a mortgage in chancery, and such deficiency decree shall be a lien upon all real estate and other property of the party against whom it is entered to the same extent and under the same limitations as a judgment at law; and in cases of excess of sales over the amount of the decree, such excess be paid to the owner of the land, or to the person who may be entitled to the same, under the direction of the court.

Sec. 20. Redemption. Upon all sales under this act, the right of redemption shall exist in favor of the same persons, and may be made in the same manner as is or may be provided for redemption of real estate from sales under judgments and executions at law.

Sec. 21. Sub-contractors; liens of sub-contractors; who are; extent of their liens superior to creditors or contractors on money due contractors; limit of owner's liability; owner liable for sub-contracts performed after notice thereof; rights of in case contractor default may complete, if contractor abandons. Every mechanic, workman or other person who shall furnish any materials, apparatus, machinery or fixtures, or furnish or perform services or labor for the contractor shall be known under this act as a sub-contractor, and shall have a lien for the value thereof, with interest on such amount from the date the same is due, from the same time, on the same property as provided for the contractor, and, also, as against the creditors and assignees, and personal and legal representatives of the contractor, on the material, fixtures, apparatus or machinery furnished, and on the moneys or other considerations due or to become due from the owner under the original contract, whether or not the original ——— contractor could have obtained a lien or was by contract or conduct divested or deprived of a right to obtain a lien. In no case, except as hereinafter provided, shall the owner be compelled to pay a greater sum for or on account of the completion of such house, building or other improvements than the price or sum stipulated in said original contract or agreement, unless payment be made to the contractor or to his order, in violation of the rights and interests of the persons intended to be benefited by this act. Provided, if it shall appear to the court that the owner and contractor fraudulently, and for the purpose of defrauding sub-contractors, fixed an unreasonably low price in their original contract for the erection or repairing of such building, then the court shall ascertain how much of a difference exists between a fair price for labor and material used in said building or other improvements, and the sum named in said original contract, and said difference shall be considered a part of the contract and be subject to a lien. But where the contractor's statement, made as provided in section five (5), shows the amount to be paid to the sub-contractor, or party furnishing material; or the sub-contractor's statement, made pursuant to section twenty-two (22), shows the

amount to become due for material; or notice is given to the owner, as provided in section twenty-four (24) and twenty-five (25), and thereafter such sub-contract shall be performed, or material to the value of the amount named in such statements or notice, shall be prepared for use and delivery, or delivered without written protest on the part of the owner previous to such performance or delivery, or preparation for delivery, then, and in any of such cases such sub-contractor or party furnishing or preparing material, regardless of the price named in the original contract, shall have a lien therefor to the extent of the amount named in such statements or notice; also, in case of default or abandonment by the contractor, the sub-contractor or party furnishing material, shall have and may enforce his lien to the same extent and in the same manner that the contractor may under conditions that arise as provided for in section four of this act, and shall have and may exercise the same rights as are therein provided for the contractor.

Sec. 22. Where partners taken in after contract; lien for material furnished to sub-contractor; lien of sub-contractor; statement of sub-contractor to owner or contractor; penalty for failure to give statement. Whenever, after a contract has been made, the contractor shall associate one or more persons as partners or joint contractors, in carrying out the same, or any part thereof, the lien for materials or labor furnished by a sub-contractor to such contractor and his partners or associates, as originally agreed upon, shall continue the same as if the sub-contract had been made with all of said partners. When the contractor shall sub-let his contract or a specific portion thereof to a sub-contractor, the party furnishing material to or performing labor for such sub-contractor shall have a lien therefor, and may enforce his lien in the same manner as is herein provided for the enforcement of liens by sub-contractors. Any sub-contractor shall, as often as requested in writing by the owner, or contractor, or the agent of either, make out and give to such owner, contractor or agent, a statement of the persons furnishing material and labor, giving their names and how much if anything is due or to become due to each of them, and which statement shall be made under oath if required. If any sub-contractor shall fail to furnish such statement within five (5) days after such demand, he shall forfeit to such owner or contractor the sum of fifty (50) dollars for every offense, which may be recovered in an action of debt before a justice of the peace, and shall have no right of action against either owner or contractor until he shall furnish such statement, and the lien of such sub-contractor shall be subject to the liens of all other creditors.

Sec. 23. Lien against fund due or to become due; contractors for public improvements, notice; duty and liability of officer notified. Any person who shall furnish material, apparatus, fixtures, machinery or labor to any contractor for a public improvement in this State shall have a lien on the money, bonds or warrants due or to become due such contractor for such improvement: Provided, such person shall, before payment or delivery thereof is made to such contractor, notify the officials of the State, county, township, city or municipality whose duty it is to pay such contractor of his claim by a written notice. It shall be the duty of such official so notified to withhold a sufficient amount to pay such claim until it is admitted, or by law established, and thereupon to pay the amount thereof to such person, and such payment shall be a credit on the contract price to be paid such contractor. Any officer violating the duty hereby imposed upon him shall be liable on his official bond to the person serving such notice for the damages resulting from such violation which may be recovered in an action at law in any court of competent jurisdiction. There shall be no preference between the persons serving such notice, but all shall be paid pro rata in proportion to the amount due under their respective contracts.

Sec. 24. Notice to the owner by sub-contractor; limitation for service of; may be served on owner, agent, architect or superintendent in charge; duties and liabilities of agents, architect and superintendent notified; excuse of notice; sub-contractors protected to amount named in; form of. Sub-contractors, or party furnishing labor or materials, may at any time after making his contract with the contractor, and shall within sixty (60) days after the completion thereof, or, if extra or additional work or material is delivered thereafter, within sixty (60) days after the date of completion of such extra or additional work or final delivery of such extra or additional material, cause a written notice of his claim and the amount due or to become due thereunder, to be personally served on the owner or his agent or architect, or the superintendent having charge of the building or improvement: Provided, such notice shall not be necessary when the sworn statement of the contractor or sub-contractor provided for herein shall serve to give the owner notice of the amount due and to whom due, but where such statement is incorrect as to the amount, the sub-contractor or material man named shall be protected to the extent of the amount named therein as due or to become due to him.

The form of such notice may be as follows: To (name of owner): You are hereby notified that I have been employed by (the name of contractor) to (state here what was the contract or what was done, or to be done, or what the claim is for) under his

contract with you, on your property at (here give substantial description of the property) and that there was due to me, or is to become due (as the case may be) therefor, the sum of dollars.

Dated at, this day of A. D.

Signature.....

Sec. 25. Notice to non-resident owner by filing claim with circuit, what claim shall consist of; when itemized account not necessary. In all cases where the owner, agent, architect or superintendent cannot, upon reasonable diligence, be found in the county in which said improvement is made, or shall not reside therein, the sub-contractor or person furnishing materials, fixtures, apparatus, machinery, labor or services may give notice by filing in the office of the clerk of the circuit court against the person making the contract and the owner a claim for lien verified by the affidavit of himself, agent or employe, which shall consist of a brief statement of his contract or demand, and the balance due after allowing all credits, and a sufficient correct description of the lot, lots or tract of land to identify the same. An itemized account shall not be necessary.

Sec. 26. Lien of laborers prefers; limitation as to laborer's notice. The claim of any person for wages as a laborer under sections fifteen (15), twenty-one (21) and twenty-two (22) of this act shall be a preferred lien.

Sec. 27. Owner's duty to retain and pay money after notice; preference to laborers; manner in which he shall make payment; liability of owner. When the owner or his agent is notified as provided in this act, he shall retain from any money due or to become due the contractor, an amount sufficient to pay all demands that are or will become due such sub-contractor, tradesman, materialmen, mechanic, or workman of whose claim he is notified, and shall pay over the same to the parties entitled thereto.

Such payment shall be as follows:

First—All claims for wages shall be paid in full.

Second—The claims of tradesmen, materialmen and sub-contractors, who are entitled to liens pro rata, in proportion to the amount due them respectively. All payments made as directed shall, as between such owner and contractor, be considered the same as if paid to such contractor. Any payment made by the owner to the contractor after such notice, without retaining sufficient money to pay such claims, shall be considered illegal and made in violation of the rights of the laborers and sub-contractors and the rights of such laborers and sub-contractors to a lien shall not be affected thereby, but the owner shall not be held liable to any laborer and sub-contractor or other person whose name is omitted from the statement provided for in sections five (5) and twenty-two (22) of this act, nor for any larger amount than the sum therein named as due such person (provided such omission is not made with the knowledge or collusion of the owner), unless previous thereto or to his payment to his contractor, he shall be notified, as herein provided, by such person of their claim and the true amount thereof.

Third—The balance, if any, to the contractor.

Sec. 28. Suits to enforce lien by sub-contractor; when can be brought, pleadings, action at law against owner and contractor; proceedings, extent of owner's liability. If any money due to the laborers or sub-contractor be not paid within ten (10) days after his notice is served as provided in sections five (5), twenty-four (24), twenty-five (25) and twenty-seven (27), then such person may either file his petition and enforce his lien as hereinbefore provided for the contractor in sections nine (9) to twenty (20) inclusive, of this act, except as to the time within which suit shall be brought or he may sue the owner and contractor jointly for the amount due him in any court having jurisdiction of the amount claimed to be due, and a personal judgment may be rendered therein, as in other cases. In such actions at law, as in suits to enforce the lien, the owner shall be liable to the plaintiff for no more than the pro rata share that such person would be entitled to with other sub-contractors out of the funds due to the contractor from the owner under the contract between them, except as hereinbefore provided for laborers, and such action at law shall be maintained against the owner only in case the plaintiff establishes his right to the lien. All suits and actions by sub-contractors shall be against both contractor and owner jointly, and no decree or judgment shall be rendered therein until both are duly brought before the court by process or publication, and in all courts including actions before a justice of the peace and police magistrates, such process may be served and publication made as to all persons except the owners as in suits in chancery. All such judgments, where the lien is established shall be against both jointly, but shall be enforced against the owner only to the extent that he is liable under his contract as by this act provided, and shall recite the date from which the lien thereof attached according to the provisions of sections one (1) to twenty (20) of this act; but this shall not preclude a judgment against the contractor, personally, where the lien is defeated.

Sec. 29. Judgment before justice of the peace; when transcript of may be filed; execution thereon; liens thereof. If the execution issued on a judgment obtained before a justice of the peace or police magistrate shall be returned not satisfied, a transcript

of such judgment may be taken to the circuit court and spread upon the records thereof, and execution issued thereon as in other cases except that the lien of the same shall be preserved as a preferred lien on the property improved from the date recited in the judgment, and enforced thereon the same as if a decree had been rendered by the circuit court in a suit to enforce such lien under the provision of this act.

Sec. 30. Proceedings for general settlement; interpleader; how liens and claims cut off and judgment thereon stayed in such proceedings. If there are several liens under sections twenty-one (21) and twenty-two (22) upon the same premises, and the owner or any person having such a lien shall fear that there is not a sufficient amount coming to the contractor to pay all such liens, such owner or any one or more persons having such lien may file his or their bill or petition in the circuit court of the proper county, stating such fact and such other facts as may be sufficient to a full understanding of the rights of the parties. The contractor and all persons having liens upon or who are interested in the premises, so far as the same are known to or can be ascertained by the claimant or petitioner, upon diligent inquiry shall be made parties. Upon the hearing the court shall find the amount coming from the owner to the contractor, and the amount due to each of the persons having liens, and in case the amount found to be coming to the contractor shall be insufficient to discharge all the liens in full, the amount so found in favor of the contractor shall be divided between the persons entitled to such liens pro rata after the payment of all claims for wages in proportion to the amounts so found to be due them respectively. If the amount so found to be coming to the contractor shall be sufficient to pay the liens in full, the same shall be so ordered. The premises may be sold as in other cases under this act. The parties to such suit shall prosecute the same under like requirements as are directed in section eleven (11) of this act, and all persons who shall be duly notified of such proceedings and who shall fail to prove their claims, whether the same be in judgment against the owner or not, shall forever lose the benefit of and be precluded from their liens and all claims against the owner. Upon the filing of such bill or petition the court may, on the motion of any person interested, and shall, upon final decree, stay further proceedings upon any suit against the owner on account of such liens, and costs in such cases shall be adjusted as provided for in section seventeen (17).

Sec. 31. Failure to complete contract by contractor; requisites and manner of sub-contractor's suit in case of; owner's liability in case of. Should the contractor, for any cause, fail to complete his contract, any person entitled to a lien as aforesaid may file his petition in any court of record against the owner and contractor, setting forth the nature of his claim, the amount due, as near as may be, and the names of the parties employed on such house or other improvement subject to liens; and a notice of such suit shall be served on the persons therein named, and such as shall appear shall have their claim adjudicated. The premises may be sold as in other cases under this act. The parties to such suit shall prosecute the same under like requirements as are directed in section eleven (11) of this act.

Sec. 32. Payment of owner to contractor; when wrongful. No payments to the contractor or to his order of any money or other considerations due or to become due to the contractor shall be regarded as rightfully made, as against the sub-contractor, laborer, or party furnishing labor or materials, if made by the owner without exercising and enforcing the rights and powers conferred upon him in sections five (5) and twenty-two (22) of this act.

Sec. 33. Limitation as to suit of sub-contractors to enforce lien. Petition shall be filed or suit commenced to enforce the lien created by sections twenty-one (21) and twenty-two (22) of this act within four months after the time that the final payment is due the sub-contractor, laborer or party furnishing material.

Sec. 34. General Provisions. Suit to be commenced or answer filed by lien claimants, and within thirty (30) days on demand of owner, lienor or interested party. Upon written demand of the owner, lienor, or any person interested in the real estate, or their agent or attorney, served on the person claiming the lien, or his agent or attorney, requiring suit to be commenced to enforce the lien or answer to be filed in a pending suit, suit shall be commenced or answer filed within thirty days thereafter, or the lien shall be forfeited, and the same released if a claim for a lien has been filed with the clerk of the circuit court.

Section 35. Neglect to satisfy lien paid or to release where not sued on time; penalty. Whenever a claim for lien has been filed with the clerk of the circuit court, either by the contractor or sub-contractor, and is afterward paid, with cost of filing same, or where there is a failure to institute suit to enforce the same after demand, as provided in the preceding section, within the time by this act limited, the person filing the same or some one by him duly authorized in writing so to do, shall acknowledge satisfaction or release thereof, in the proper book in such office, in writing, on written demand of the owner, and on neglect to do so for ten days after such written demand he shall forfeit to the owner the sum of twenty-five (25) dollars, which may be recovered in an action of debt before a justice of the peace.

Sec. 36. **Penalty for wrongful sale, use or removal of materials.** Any owner, contractor, sub-contractor or other person who shall purchase materials on credit and represent at the time of purchase that the same are to be used in a designated building or buildings, or other improvement, and shall thereafter sell, use or cause to be used the said materials in the construction of, or remove the same to any building or improvement other than that designated, or dispose of the same for any purpose, without the written consent of the person of whom the materials were purchased, with intent to defraud such person, shall be deemed guilty of a misdemeanor, and on conviction shall be punished by a fine not exceeding five hundred dollars (\$500), or confined in the county jail not exceeding one year, or both so fined and imprisoned.

Sec. 37. **Liens against boats, barges and water craft.** Any architect, contractor, sub-contractor, materialman, or other person furnishing services, labor or material for the purpose of or in constructing, building, altering, repairing or ornamenting a boat, barge or other water craft, shall have a lien on such boat, barge or other water craft for the value of such services, labor or material in the same manner as in this act provided for services, labor or material furnished by such parties for the purpose of building, altering, repairing or ornamenting a house or other building. And such lien may be established and enforced in the same manner as liens are established and enforced under this act, and the parties shall be held to the same obligations, duties and liabilities as in case of a contract for building, altering, repairing or ornamenting a house or other building.

Sec. 38. **Circuit Court Clerk's duties with regard to claims filed; abstract fee.** When claims for lien are filed pursuant to the provisions of sections seven (7) and twenty-five (25), the clerk of the circuit court shall endorse thereon the date of filing, and make an abstract thereof in a book kept for that purpose and properly indexed, containing the name of the person filing the lien, the amount of the lien, the date of filing, the name of the person against whom the lien is filed, and a description of the property charged with the lien, for which the person filing the lien shall pay one dollar (\$1.00) to the clerk.

Sec. 39. This act is and shall be liberally construed as a remedial act.

Sec. 40. An act entitled, "An act to revise the law in relation to mechanic's liens," approved and in force June 26th, 1895; and all other acts and parts of acts inconsistent with this act are hereby repealed: Provided, that this section shall not be construed as to affect any rights existing or actions pending at the time this act shall take effect.

Approved May 18th, 1903.

SPECIFICATIONS FOR STANDARD HOLLOW TILE FIREPROOFING.

GENERAL.—The contractor for this work will be required to furnish all the material and labor of every description required to erect the same in place complete. The contractor is referred to the plans and details for the general construction, and especially the steel diagrams and details showing connection between the structural steel and tile work.

SPECIAL SHAPES.—The contractor shall furnish all necessary special shapes for the proper fitting to the steel work.

DETAILS.—When requested to do so the contractor shall furnish large scale details or full sized drawings for all special shapes, column coverings, lintel covers, girder covers, and general type of arch, which shall be submitted to the architects for their approval.

SCAFFOLDING, TOOLS, ETC.—Furnish all the tools, machinery, hoisting apparatus and centering necessary to carry on the work at the rate of progress stipulated in the contract.

TILE.—All the tile required for this work shall be of the best quality of hard burned fire clay, semi-porous, or porous terra cotta. This tile to be well manufactured, no badly split, cracked or warped tile will be permitted to go into the work.

MORTAR AND LAYING.—All tile work for the floor construction shall be laid in mortar composed of one (1) part American Portland Cement, of approved brand, four (4) parts sharp sand and one part (1) lime mortar, all thoroughly well mixed together as follows: The sand and cement are to be mixed together dry and sufficient water added to thoroughly wet the same, after which the lime mortar is to be added and the whole mass is then to be thoroughly tempered. All other tile work is to be laid in mortar composed as follows: One (1) part Louisville, Rosendale, or other natural cement, three (3) parts sharp sand and one part lime mortar, thoroughly mixed in the manner before described. All tile must be laid with full flush joints, plumb, to a line, with horizontal beds uniformly level on each course. Fill all the joints, chinks and crevices between the tile and steel work with mortar well slushed in.

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TYPE OF ARCH.—The arches for the floors in general shall be ——— inch; flat or segment arches, with side or end construction. Skewbacks carefully bedded in place against beams.

BEAM TILE.—The soffits of all beams to be protected with slabs of tile at least 1 inch in thickness. If more than one inch, the beam tile must be made with air space next to beam.

ROOFS.—The arches for the main roof are to be ——— in segment or flat arches same as specified for the floors.

MINOR ROOFS.—The roofs of pent houses, roof over projecting portion in second story, floor of bulkheads, and other portions indicated on details as book-tile shall be made of three-inch (3 in.) book-tile set in place between tee-irons. Tee-irons to be furnished by the iron contractor.

PARTITIONS.—All partitions shown on the plans to be built the thickness indicated in figures. If no dimensions are given, the following sizes will govern:

Partitions for all corridors and for partitions over 12 feet and up to 14 feet in height to be 4 inches. Partitions over 14 feet in height to be 6 inches, and all cross partitions 12 feet or less to be 3 inches. Partition walls to be built straight, true, plumb and well bonded with proper "breakjoint" bond on each alternate course, and all joints thoroughly flushed up with mortar, and to be well wedged underneath.

FURRING TILE.—Where indicated on plans, 2 inch furring tile are to be built against the outside walls of the building. These tiles are to be secured to the brick walls with 10d spikes on every third course, driven into the brickwork at intervals not greater than 48 inches apart.

CURB WALL.—The curb wall in basement shall be furred with three-inch (3 in.) tile extending up to the under side of the iron plate along edge of curb wall and properly fitting around all beams.

ROUGH FRAMES AND BLOCKS.—The contractor for carpenter work will furnish and erect the rough wood frames at all openings in partitions and furring. He will also furnish all wooden blocks necessary to form nailing facilities for attaching plaster grounds, etc. These blocks must be built in place by fireproofing contractor wherever directed by the architect.

COLUMN COVERING.—All column covering shall start, in all cases, directly from the tile arches of floor. Column covering shall be designed to properly fit the columns.

All corners of square columns shall be left square or round. Column covering to be wired on once or twice in each course in height or secured together with clamps.

COVERING EXPOSED STEEL WORK.—All girders, beams, channels, etc., that show below the under side of ceilings are to be encased on all sides with at least 1-inch thickness of fire-proof tile secured to the steel in the usual manner. If required, special designs must be submitted to the architect.

BOXES FOR PLUMBING PIPES.—All soil, vent, down spout and water supply pipes shall be boxed in, using three-inch (3 in.) tile, starting from the floor tile in all cases. This boxing shall not be done until the pipes have been properly tested, and covered by another contractor. There shall be no openings into boxes except for outlets on the various floors. Where these outlets occur small wood frames furnished by carpenter shall be set by the fireproofing contractor.

BULKHEADS.—All bulkheads of first and second floor shall be built of 3-inch tile; the structural iron contractor furnishing all necessary tee-irons for the support of the tile. See details for bulkhead treatment, and iron drawings for the supports.

Provide three-inch (3 in.) tile for the ends of bulkheads where intersected by the entrance doors.

TOILET ROOM FLOORS.—All toilet room floors where shown on plans shall be raised approximately one foot with fireproofing. Supports to be so arranged as not to interfere with the piping of these rooms.

PENT HOUSES.—The contractor shall build the walls of pent houses with four-inch (4 in.) hard or glazed tile, laid up in Portland cement mortar, all joints to be thoroughly flushed up.

Curbs of all skylights shall be built of four-inch tile.

FLOOR STRIPS AND CONCRETE FILLING.—After the floor arches have been set in place, and at such times as may be designated by the architect, the contractor for carpenter's work will furnish and set the 2x3-inch wood floor strips required as nailing ground for the finished wood flooring, where wooden flooring is called for.

After the strips have been set, the fireproofing contractor must fill in between the same with concrete filling; this concrete is to be composed of one (1) part American Portland Cement, of approved brand, two (2) parts sharp sand, and six parts broken tile, stone, gravel or fine, clean coal cinders, thoroughly mixed together dry, then tempered and mixed, and tamped in place. In no case shall cinder concrete be allowed to come in contact with structural steel.

FINALLY.—Do everything necessary to finish the entire work in a thorough and substantial manner. Remove promptly from the premises all the tools, scaffolding, unused tile, debris, etc., as soon as the work is completed.

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DEPARTMENT OF ELECTRICITY.

CITY OF CHICAGO.

NOTICE.

Particular attention is called to the different sections of the ordinance herein printed: Permit must be obtained before any work is done.

The use of electric current is prohibited previous to certificate being issued.

Conditions unsafe to life or property must be corrected within forty-eight hours.

Each building must have independent service from street or alley.

Wires must not pass through party walls, over roofs or under sidewalks.

Current must not be supplied from trolley lines for motors or light except for power stations owned by company.

Temporary work must be inspected and approved before current is used.

Alterations to existing wiring must not be made without regular permit.

Permits issued by the Commissioner of Public Works for electrical work to be done on streets must be countersigned by the Department of Electricity.

Violation of any of the Sections of this ordinance constitutes a misdemeanor and renders any person, firm or corporation liable to arrest and fine of not less than \$50 or more than \$100, also the cutting off and stopping of current used in violation until the provisions are complied with.

In the drawing of specifications for electrical work it is the duty of architects to require the contractors accepting work under the specifications to furnish a certificate of inspection from the Department of Electricity, City of Chicago, covering their work, which in itself assures that the work has been done according to the rules and regulations of the department.

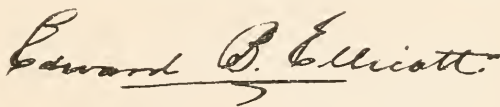
IMPORTANT NOTICE.

After February 1st, 1903, this Department will not approve of the installation of concealed wires on insulating supports, which is commonly known as "concealed knob and tube work."

In all new buildings and in alteration work of old buildings, all new concealed wires must be encased in approved metal conduits. (See Rule No. 25 for details of use).

In wiring or rewiring parts of old buildings which are not liable to dampness, an approved metallic or non-metallic flexible conduit may be used; provided that this Department receives notice before contract is let for such wiring, in order that it can ascertain that such portions of buildings are not liable to dampness. In each instance a special written permit must be obtained.

Yours very truly,



City Electrician.

GENERAL SUGGESTIONS.

In all electric work conductors, however well insulated, should always be treated as bare, to the end that under no conditions, existing or likely to exist, can a grounding or short circuit occur, and so that all leakage from conductor to conductor, or between conductor and ground, may be reduced to the minimum.

In all wiring special attention must be paid to the mechanical execution of the work. Careful and neat running, connecting, soldering, taping of conductors and securing and attaching of fittings, are especially conducive to security and efficiency, and will be strongly insisted on.

In laying out an installation, except for constant-current systems, the work should, if possible, be started from a center of distribution, and the switches and cutouts, controlling and connected with the several branches, be grouped together in a safe and easily accessible place, where they can be readily got at for attention or repairs. The load should be divided as evenly as possible among the branches, and all complicated and unnecessary wiring avoided.

JUDSON McFELL,
Pres. and Treas.

C. BUCKLES,
Secretary.

McFell Electric Co.

ELECTRICAL ... CONTRACTORS,

Room 801,

303-305 DEARBORN ST., CHICAGO.

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The use of the wire-ways for rendering concealed wiring permanently accessible is most heartily indorsed and recommended; and this method of accessible concealed construction is advised for general use.

Architects are urged, when drawing plans and specifications, to make provision for the channeling and pocketing of buildings for electric light or power wires, and in specifications for electric gas lighting to require a two-wire circuit, whether the building is to be wired for electric lighting or not, so that no part of the gas fixtures or gas piping be allowed to be used for the gas-lighting circuit.

SPECIAL NOTICE.

Place all service switches, meters and cut-outs, when practicable, in basements or public places where they will be readily accessible to inspectors, meter readers and trouble men, in order to obviate the necessity of interfering with tenants of apartments. It often occurs that tenants of apartment buildings who are not using electric current are annoyed by the visits of inspectors and trouble men in their necessary duties in making inspections or repairs for other tenants.

The placing of meters in basements or halls will largely do away with the annoyance caused by their disagreeable humming and it will be much more satisfactory to all concerned.

SECTIONS OF THE REVISED CODE OF THE CITY OF CHICAGO, GOVERNING ELECTRICAL INSPECTIONS.

January 1, 1899.

CHAPTER XXV.—DEPARTMENT OF ELECTRICITY.

596. **Electric Current.**—No electric current shall be used for illumination, decoration, power or heating, except as hereinafter provided.

597. **Application—Contents—Permits.**—All persons, firms or corporations desiring to install wires or other apparatus for the use of electric currents for any of the purposes mentioned in the preceding section of this chapter shall, before commencing or doing any electrical construction work of any kind whatever, either installing new electrical apparatus or repairing apparatus already in use, file an application for a permit therefor in the office of the City Electrician, which application shall describe in detail such material and apparatus as it is desired to use, with a full description of the same, giving the locality by street and number; and upon receipt of which application, if found proper, such permit shall be given.

598. **Duties of City Electrician Thereon.**—The said City Electrician shall then have power, and it shall be his duty, when by him deemed necessary, to carefully inspect any such installation previous to and after its completion, and it shall be competent for him to remove any existing obstructions which may prevent a perfect inspection of the current carrying conductors, such as laths, plastering, boarding or partitions; and if such installation shall prove to have been constructed in accordance with the rules and requirements of the fire department of the City of Chicago, controlling the use of electric current, upon the payment of a fee, as herein provided, he shall issue a certificate of such inspection, which shall contain a general description of the installation and the date of said inspection. The use of electric current is hereby declared to be unlawful previous to the issuance of said certificate; provided, however, the City Electrician may issue a temporary permit for the use of electrical current during the course of construction or alteration of buildings, which permit shall expire when the electrical apparatus for such building is fully installed.

598a. **Preliminary and Final Certificate.**—A preliminary certificate may be issued by said City Electrician, in the case of completed installations, but upon which no current will be used in the immediate future. Such preliminary certificate shall show that at the date of inspection the installation was erected in accordance with the terms of this

chapter, and shall be issued at one-half the rates hereinafter named. Prior to the introduction of electric current into the said premises a second inspection shall be made, when if the said installation is still in accordance with the terms of this chapter, a complete and final certificate shall issue, and the amount of the fee paid for the preliminary certificate shall be deducted from the fee for the final certificate. Any owner or owners of property installing electric wires to be hidden from view shall, prior to such installation, give said City Electrician a reasonable notice in order to give ample time for inspection.

598b. Power of City Electrician — Inspections and Re-inspections. — The said City Electrician is hereby empowered to inspect or re-inspect all overhead, underground and interior wires and apparatus conducting electric current for light, heat or power, and when said conductors or apparatus are found to be unsafe to life or property, shall notify the person or persons, firms or corporations owning, using or operating them to place the same in a safe and secure condition within forty-eight hours. Any person, firm or corporation failing or refusing to repair, change or remove the same within forty-eight hours after the receipt of such notice, shall be subject to the penalty hereinafter provided.

598c. Poles — Covers — Wires — Electric Service Entrances — Switches. — All poles now standing or hereafter erected, and all covers for manholes now in service, or hereafter placed in service for the use of electric conductors, shall be branded or stamped with the name of the person, firm or corporation owning the same; all electric service entrances shall have attached to the conductor or conductors, in a conspicuous place, a substantial tag designating the owner of, and giving such a full description of the conductors as shall meet with the approval of said City Electrician; and all of said electric service entrances shall be properly equipped with approved cut-out service switches. Each building into which electric current shall hereafter be introduced shall have independent service from the street or alley, entering at right angles with the street curb; and no wires hereafter put up shall pass from one building to another through any party wall or along any building wall or over any roof or under any sidewalk. No electric current shall be supplied from any trolley line for any purpose whatever to any building except for lighting the power stations from which current is supplied to such trolley lines.

598d. Fees. — There shall be collected by the City Electrician and paid into the Treasury of the City of Chicago, upon the issuance of certificates permitting the use of electric current, the following fees:

For each arc light, the sum of one dollar.

For incandescent lamps of nominal 16 candle power, and for larger or smaller lamps in that proportion, up to and including 100 lamps, the sum of ten cents each.

For incandescent lamps, second 100, or part thereof as above, the sum of nine cents each; third 100, or part thereof as above, eight cents each; fourth 100 or part thereof as above, seven cents each; fifth 100 or part thereof as above, six cents each; for each additional 100 lamps, or part thereof as above, five cents each; but no inspection shall be made for a less amount than one dollar.

For each electrical horse-power of 746 Watts, used for mechanical or other purposes than above mentioned, the sum of one dollar for each horse-power from one to five horse-power, inclusive.

For each of the next succeeding 5 horse-powers, or part thereof as above, eighty-five cents; for each of the next succeeding 5 horse-powers, or part thereof as above, seventy-five cents; for each of the next succeeding 10 horse-powers, or part thereof as above, sixty cents; for each of the next succeeding 25 horse-powers, or part thereof as above, fifty cents; for each of the next succeeding 50 horse-powers, or part thereof as above, forty cents; for each additional horse-power, or part thereof as above, twenty-five cents; but no inspection shall be made for a less amount than one dollar.

Inspections of temporary installations for show-window exhibitions, conventions and the like, shall be charged for by the time required for such inspections at the rate of fifty cents per hour.

Each re-inspection of any overhead, underground or interior wires or apparatus, shall be charged for by the time required for such re-inspection at the rate of fifty cents per hour.

ARC LAMPS.

2 arc lamps at \$1, \$2; above 2 lamps to 5.....	at 80 cents each
5 arc lamps, \$4.40; above 5 lamps to 10.....	at 70 cents each
10 arc lamps, \$7.90; above 10 lamps to 20.....	at 60 cents each
20 arc lamps, \$13.90; above 20 lamps to 30.....	at 50 cents each
30 arc lamps, \$18.90; above 30 lamps.....	at 25 cents each

INCANDESCENT LAMPS.

25 lamps, \$2.50; above 20 to 50 lamps.....	at 9 cents each
50 lamps, \$4.75; above 50 to 70 lamps.....	at 8 cents each
75 lamps, \$6.75; above 75 to 100 lamps.....	at 7 cents each
100 lamps, \$8.50; above 100 to 200 lamps.....	at 6 cents each
200 lamps, \$14.50; above 200 to 300 lamps.....	at 5 cents each
300 lamps, \$19.50; above 300.....	at 4 cents each

MOTORS.

5 horse power, \$5; above 5 to 10 horse power.....	at 75 cents
10 horse power, \$8.75; above 10 to 15 horse power.....	at 65 cents
15 horse power, \$12; above 15 to 25 horse power.....	at 55 cents
25 horse power, \$17.50; above 25 to 50 horse power.....	at 50 cents
50 horse power, \$30; above 50.....	25 cents

598e. **Record — Annual Report.** — It shall be the duty of said City Electrician to keep records containing a full and accurate account of all inspections made and of all moneys received; he shall annually, on or before the first day of February in each year, prepare and present to the City Council a report showing the receipts and expenditures and entire work of his department during the previous fiscal year; and he shall at the same time send to the Comptroller a full and comprehensive statement of all matters pertaining to his department, together with an estimate in detail of the appropriations required by this department during the next fiscal year.

598f. **Alterations.** — No alterations shall be made in any installation without first notifying the said City Electrician and submitting the same for similar inspection, as above provided.

598g. **Penalty.**—The Furnishing or use of any electric current within the limits of the City of Chicago, by any person or persons, firm or corporation, in any manner contrary to the provisions of this Chapter, shall constitute and be a misdemeanor, and any person, firm or corporation found guilty of such misdemeanor shall be punished by a fine of not less than fifty dollars nor more than one hundred dollars, and each day's use thereof contrary to the provisions of this Chapter shall constitute and be a separate offense and misdemeanor. Said City Electrician may, for any violation of the provisions of this Chapter, also order and compel the cutting of and stopping of such current until the provisions of this Chapter are fully complied with.

The following Sections have also been passed governing electrical construction work, and made a part of Chapter LXI, Article II, of the Revised Code of Chicago.

1902a. **Requirements Before Permits Can Be Issued.**—All applications for permits to erect poles in the streets and alleys in the City of Chicago shall provide that the City of Chicago may use the poles to be so erected and attach thereto such necessary cross-arms, wires or other electrical appliances as may be deemed necessary for the electrical service of the city, and no permit shall be issued by the Commissioner of Public Works to any person, firm or corporation operating under a valid ordinance, in which the application and permit does not provide for the privileges required by the city as herein contained.

1902b. **Fees.**—A fee of two (\$2) dollars shall be charged for each permit issued by the Commissioner of Public Works for the erection of all poles, lines or wires, or electric conductors of any description whatever, or for any laying of underground electrical conduits or the placing of conductors therein.

Said fees shall be collected by the City Electrician before he countersigns any such permit, and shall be deposited by him in the City Treasury and credited to a special deposit fund to be used for the purpose of extending the electric lighting system of the city.

Table of Carrying Capacity of Wires.

B. & S. G.	TABLE A. Rubber Covered Wires.		TABLE B. On Porcelain Knobs—Open Work.	
		Amperes.		Amperes.
18.....		3		
16.....		6		
14.....		12.....		19
12.....		17.....		24
10.....		24.....		32
8.....		33.....		43
6.....		46.....		57
5.....		54.....		63
4.....		65.....		74
3.....		76.....		83
2.....		90.....		98
1.....		107.....		117
0.....		127.....		140
00.....		150.....		157
000.....		177.....		185
0000.....		210.....		225
Circular Mills.				
200,000.....		200.....		
250,000.....				285
300,000.....		270.....		355
350,000.....				377
400,000.....		330.....		415
500,000.....		390.....		485
600,000.....		450.....		545
700,000.....		500.....		600
800,000.....		550.....		655
900,000.....		600.....		710
1,000,000.....		650.....		765
1,100,000.....		690.....		
1,200,000.....		730.....		
1,300,000.....		770.....		
1,400,000.....		810.....		
1,500,000.....		850.....		
1,600,000.....		890.....		
1,700,000.....		930.....		
1,800,000.....		970.....		
1,900,000.....		1,010.....		
2,000,000.....		1,050.....		

The lower limit is specified for rubber-covered wires to prevent gradual deterioration of high insulations by heat of wires, but not from fear of igniting the insulation. Question of drop is not taken into consideration in above tables.

The carrying capacity of sixteen and eighteen wire is given, but no smaller than fourteen is to be used, except as allowed under Rules 24 u and 40 c.

Materials.

The following is a list of non-combustible, non-absorptive, insulating materials for the benefit of those who might consider hard rubber, fiber, wood and the like as fulfilling the requirements.

1. Glass.
2. Marble (filled).
3. Slate without metal veins.
4. Porcelain, thoroughly glazed and vitrified.
5. Pure Sheet Mica.
6. Lava (certain kinds of).
7. Alberene Stone.

Electric Gas Lighting—

Where electric gas lighting is to be used on the same fixture with the electric light: No part of the gas piping or fixture shall be in electric connection with the gas lighting circuit.

The wires used with the fixtures must have a non-inflammable insulation, or, where concealed between the pipe and shell of the fixture, the insulation must be such as required for fixture wiring for the electric light.

The whole installation must be test free from "grounds."

The two installations must test perfectly free from connection with each other.

AN ACT RELATING TO FIRE ESCAPES.

Section 1. Be it enacted by the People of the State of Illinois represented in the General Assembly: That within six (6) months after the passage of this act, all buildings in this State which are four or more stories in height, excepting such as are used for private residences exclusively, but including flats and apartment buildings, shall be provided with one or more metallic ladder or stair fire escapes attached to the outer walls thereof and extending from, or suitably near the ground, to the uppermost story thereof, and provided with platforms of such forms and dimensions, and in such proximity to one or more windows of each story above the first, as to render access to such ladder or stairs from each such story easy and safe; the number, location, material and construction of such escapes to be subject to the approval of the board of supervisors in the counties under township organization, and a board of county commissioners in counties not under township organization, except in villages, towns and cities organized under any general or special law of this State, such approval shall be had by the corporate authorities of such villages, towns and cities: *Provided*, however, that all buildings more than two stories in height, used for manufacturing purposes or for hotels, dormitories, schools, seminaries, hospitals or asylums, shall have at least one such fire escape for every fifty (50) persons for which working sleeping or living accommodations are provided above the second stories of said buildings; and that all public halls, which provide seating room above the first or ground story, shall be provided with such numbers of said ladder or stair fire escapes as the board of supervisors or commissioners or corporate authorities aforesaid may direct.

Sec. 2. All buildings of the number of stories and used for the purposes set forth in Section one (1) of this act, which shall be hereafter erected within this State, shall upon or before their completion each be provided with fire escapes of the kind and number, and in the manner set forth in said Section (1) of this act.

Sec. 3. The boards of supervisors and commissioners, and in villages, towns and cities, the corporate authorities thereof, as aforesaid, shall direct the sheriff of their respective counties to serve a written notice in behalf of the people of the State of Illinois, upon the owner or owners, trustees, lessee or occupant of any building within their county, not provided with fire escapes in accordance with the requirements of this act commanding such owners, trustees, lessee or occupant, or either of them, to place or cause to be placed upon such building such fire escape or escapes within thirty (30) days after the service of such notice. And the grand juries of the several counties of this State may also, during any term, visit or hear testimony relating to any building or buildings within their respective counties, for the purpose of ascertaining whether it or they are provided with fire escapes in accordance with the requirements of this act, and to submit the result of their inquiry, together with any recommendations they may desire to make, to the circuit court, except in Cook county, and to the criminal court of Cook county, and said court may thereupon, if it find from the report of said grand jury that said buildings or building is or are not provided with a fire escape or escapes in accordance with this act, cause the sheriff to serve a notice or notices upon the owner, trustees, lessee or occupant of such building or buildings.

Sec. 4. Any such owner or owners, trustees, lessee or occupant, or either of them, so served with notice as aforesaid, who shall not within thirty (30) days after the service of such notice upon him or them, place or cause to be placed such fire escape or escapes upon such building as required by this act and the terms of such notice, shall be subject to a fine of not less than twenty-five (25) nor more than two hundred (200) dollars, and, to a further fine of fifty (50) dollars for each additional week of neglect to comply with such notice.

Sec. 5. All the money or moneys collected as fines under and by virtue of this act shall be paid into or placed to the credit of the common school fund of the counties in which they are collected.

Sec. 6. Any person may at any time make complaint in writing to the board of supervisors or commissioners or corporate authorities whose duty it is hereunder to enforce this law, that such escape or escapes are needed or are unsafe or insufficient, and it shall be the duty of such board of supervisors or commissioners or corporate authorities to at once inspect such building and escape or escapes and cause the sheriff to notify the owner, occupant or party in control, to immediately take such steps as to overcome the cause of complaint, and any officer, officers or persons failing to comply with this act, upon such complaint being made, shall be fined upon conviction, for each offense, not less than five dollars nor more than one hundred dollars, in any court of competent jurisdiction.

Sec. 7. That an act entitled, "An act relating to fire escapes for buildings," approved May 27, 1897, and in force July 1, 1897, and all other acts and parts of acts inconsistent with the provisions of this act, be and the same are hereby repealed.

Sec. 8. Whereas, an emergency exists that this act shall take effect without delay, therefore this act shall take effect and be in force from and after its passage.

FIRE LIMITS.

Commencing at a point on the shore of Lake Michigan and a line one hundred and fifty feet north of Belmont avenue, thence west on said line to the center of Halsted street; thence south on center of Halsted street to center of Fullerton avenue; thence west on center of Fullerton avenue to the north branch of the Chicago river; thence along the said river to the center of Belmont avenue; thence west on center of Belmont avenue to center of North Kedzie avenue; thence south on center of North Kedzie avenue to center of West North Avenue; thence west on center of West North avenue to center of North Fortieth avenue; thence south on center of Fortieth avenue to center of alley lying immediately north of Park avenue; thence west on center of said alley to center of Forty-sixth avenue; thence south on center of Forty-sixth avenue to center of West Madison street; thence west on center of West Madison street to center of Forty-eighth avenue; thence north on Forty-eighth avenue to center of Kinzie street; thence west on center of Kinzie street to center of Fifty-second avenue; thence south on center of Fifty-second avenue to center of West Madison street; thence east on center of West Madison street to center of Forty-eighth avenue; thence south on center of Forty-eighth avenue to center of Jackson street; thence east on center of Jackson street to center of South Forty-sixth avenue; thence south on center of South Forty-sixth avenue to center of West Harrison street; thence west on center of West Harrison street to center of South Forty-eighth avenue; thence south on South Forty-eighth avenue to center of West Twelfth street; thence east on center of West Twelfth Street to center of South Forty-sixth avenue; thence south on center of South Forty-sixth avenue to center of West Twenty-second street; thence east on center of West Twenty-second street to center of South Fortieth avenue; thence south on South Fortieth avenue to the Illinois and Michigan canal; thence along the said canal to center of South Western avenue; thence south on South Western avenue to center of West Thirty-ninth street; thence east on center of West Thirty-ninth street to center of State street; thence south on center of State street to center of Seventy-fifth street; thence on center of Seventy-fifth street to Lake Michigan; thence northwest along the shore of Lake Michigan to place of beginning.

Also that territory bounded on the east by State street, on the north by Forty-seventh street, on the west by a line seventy-five feet west of and parallel to the west line of State street, and on the south by Sixty-third street.

Also that territory bounded on the north by Forty-seventh street, on the east by a line seventy-five feet east of and parallel with the east line of Wentworth avenue, on the south by Sixty-third street, and on the west by a line seventy-five feet west of and parallel with the west line of Wentworth avenue.

Also that territory bounded on the north by Forty-seventh street, on the east by a line seventy-five feet east of and parallel with Halsted street, on the south by Sixty-third street, and on the west by a line seventy-five feet west of and parallel with the west line of Halsted street.

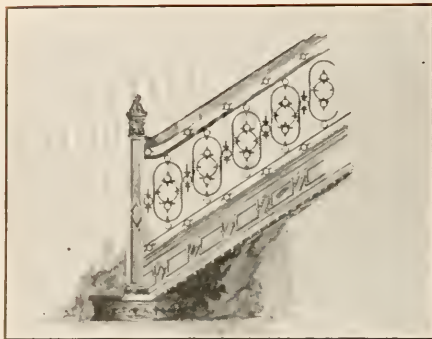
Also that territory bounded on the north by the north line of Forty-seventh street, on the east by State street, on the south by a line seventy-five feet south of and parallel with the south line of Forty-seventh street, and on the west by Halsted street.

Also that territory bounded on the north by a line seventy-five feet north of and parallel with the north line of Sixty-third street, on the east by State street, on the south by Sixty-third street, and on the west by Ashland avenue.

Also that territory bounded on the south by Sixty-third street, on the east by Wentworth avenue, on the north by the center line of Sixty-first street, and on the west by the center line of Princeton avenue.

Also that territory commencing at the intersection of Manistee avenue and the Lake Shore and Michigan Southern Railroad; thence northeasterly and north on center of Manistee avenue to the center of Eighty-ninth street; thence east on center of Eighty-ninth street to center of Mackinaw avenue; thence south on center of Mackinaw avenue to center of Harbor avenue; thence southwesterly along center of Harbor avenue and said Harbor avenue extended to northeast line of said Lake Shore and Michigan Southern Railroad; thence northwest along northeast line of said Lake Shore and Michigan Southern Railroad to place of beginning.

Provided, however, that any person or corporation desiring to erect a frame or wooden building, to be used for residence or mercantile purposes, within that portion of the territory bounded on the east (between 67th and 75th streets) by Lake Michigan, on the south by the center line of Seventy-fifth (75th) street, on the west by the center line of State street to the intersection of Sixty-third (63rd) street; thence east along the center line of Sixty-third (63rd) street to the intersection of Cottage Grove avenue; thence south along the center line of Cottage Grove avenue to the intersection of Sixty-seventh (67th) street; thence along the center line of Sixty-seventh (67th) street to Lake Michigan, shall have a right to do so, within the limits above defined, upon presenting a petition to the Commissioner of Buildings of the City of Chicago, together with a plat, plans and specifications showing the place where such building is to be erected. Such petition shall be verified by the affidavit of the applicant and shall contain the written consent of the owners of a majority of the frontage upon each side of the street upon which the building is to be erected for a distance of five hundred (500) feet each way. No frame or wooden residence or mercantile building shall be erected within the said limits exceeding forty (40) feet in height, except the basement story shall be constructed of brick or stone, when the height shall not exceed forty-five (45) feet above the sidewalk.



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STEEL IN BUILDING CONSTRUCTION.

Characteristics of the Metal. Bessemer, Thomas-Gilchrist, Martin and Siemens' Inventions Described, Etc.

By Robert W. Hunt, C. E.

The use of steel in building construction of practically all kinds has become so general, that the character of the metal employed deserves most careful consideration. It is no safer to assume that steel is steel than to accept as reliable material any cement offered simply because it is designated as "Portland."

Cast iron was the first metal used by builders, and even yet is playing a conspicuous part; but its limitations were soon proven, and late experiences tend to render them still narrower. On the other hand, the use of "wrought" or elastic metal, first iron, and later steel, has constantly progressed; such severe tests as the Baltimore fire serving to increase confidence in it. Many years ago the disastrous collapse of cast iron columns in a Massachusetts cotton mill illustrated the necessity of care in casting such members, as well as in the selection of the metal used. And while, fortunately, there has not been any such exceptionally fatal illustrations of the failure of badly treated or unfit steel members; at the same time, there have been many failures.

While fortunately steel is an easy metal to manipulate, and the developments of metallurgy have made it a cheap one to produce, it is at the same time most sensitive to treatment, particularly heat treatment, so that no matter how superior the metal may be from a chemical standpoint, it can be made worthless by careless workmen; and, unfortunately, such negligence may not leave any surface indications of the damage done. At the same time, its chemical constitution should not be disregarded, particularly as the percentage of certain elements are increased, so does the liability to damage in manipulation.

Many years ago Mr. William Metcalfe, in a contribution to the proceedings of the American Institute of Mining Engineers, described a simple, and at the same time comprehensive, experiment illustrating the effect of heat on steel, and it is one which almost anyone can make for themselves. To one who is not familiar with the subject the results will certainly be surprising. It is: Take an inch square bar of steel of any grade, and at distances one inch apart, have nicks made by a cold chisel; then insert the bar in an ordinary blacksmith's fire, and bring the end farthest in the fire up to a bright yellow heat. Withdraw the bar and allow it to slowly cool. When cold, break it by blows of a hammer at each nick, and it will be found that the fractures will clearly indicate the degree of heat to which the bar had been subjected at each point. The extreme end of the bar, having been exposed to the highest heat, had become the hottest; the temperature diminishing as the limits of the fire was reached. The fracture at the nick nearest the end will be the coarsest in grain, which condition will decrease at each nick in proportion to the heat to which the steel had been subjected, until the comparatively cold metal has been reached, where there will not have been any change produced. Of course the finer the grain of the steel, the greater its tensile strength; and the higher the percentage of carbon which it contains the more will it be affected by heat treatment.

Now supposing that instead of permitting the bar of steel to become cold after heating it, work had been put upon it, by either hammering or rolling; it would have been found that the coarsening effects of the heating had been overcome, and in many cases, the grain of the bar made even finer, and hence stronger, than it was before the operations. But if the heating had been raised to a degree higher than that particular grade of steel would bear, no matter how much subsequent work was put upon it, the damage could not have been overcome.

The increased use of steel would have been impossible had not its cost been greatly reduced through the discovery and development of new processes of manufact-

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ure, permitting its rapid production and manipulation in large masses. The first and most revolutionary one of these was the Bessemer. This rendered possible the casting cheaply of large masses of metal into single ingots, from which structural and other shapes of large section could be rolled. Wrought iron cannot be so treated. It is impracticable to produce single masses of it weighing over 150 pounds, and even they are not homogeneous. Therefore in the production of large sections, it is necessary to elongate these small "balls" into bars, cut them into proper lengths; pile these one upon the other, until the needed size and weight is obtained. This "pile" of bars is then heated to the welding point, and while at that temperature, rolled into the desired shape. Between each bar there must be a weld to produce good results, and such welding may be imperfect at any point. Hence it can easily be appreciated why it is more difficult to produce perfect structural shapes of wrought iron than of steel. At the same time, the homogeneity of steel makes it more liable to rupture at any point where the surface may be broken than is the case with wrought iron. This necessitates care in fabrication, and renders it necessary that in slotting all sharp angles should be avoided; also care must be exercised where punching is required. In fact many authorities insist that all punched holes should afterwards be reamed. There is no doubt that drilling is always to be preferred, but of course it is much more expensive. As stated, the Bessemer process revolutionized the steel business. As has happened in many other cases, too much was expected of the new metal, or rather, its adoption was faster than the understanding of its qualities. This resulted in failures which were very disappointing. At first anything produced by the process was supposed to be adapted for almost any purpose, but experience soon demonstrated that instead of there being Bessemer steel, there were Bessemer steels; and that the metal must be varied in its chemical and physical characteristics for the different uses. As the art progressed, this was done, and in a few years the difficulties were largely overcome; but commercial conditions always govern, and the demand for cheaper material kept ever present. Unfortunately this has frequently caused the question of quality to be ignored, and with sometimes very bad results.

The tremendous increase in the use of Bessemer steel has caused a drain upon the world's iron ore supply. There are two Bessemer processes. The original one requires that the converting vessel in which the metal is changed from iron into steel shall be lined with a refractory material high in silica. To obtain sufficient heat to successfully conduct the operation, the iron used must contain a somewhat high percentage of silicon; in consequence of these conditions, the slag formed during the conversion is acid from the reduced silicon, and in the presence of such a slag, the elimination of the phosphorus contained in the treated iron is impossible. In fact, as that element is not, and the carbon, manganese and silicon and some iron, are reduced during the operation, the phosphorus in the resulting steel will be increased in a ratio equal to the loss of the other elements, which will be quite 8 per cent. This is known as the Acid Bessemer process, and the above facts make the iron ores adapted to it dependent upon their phosphorus content.

In time the Thomas-Gilchrist invention was perfected. This requires the converter to be lined with a basic material, so that the slag will be basic, and by the addition of more lime, the phosphorus can be drawn from the iron to the slag, and thereby ores much higher in phosphorus are available. This is known as the Basic Bessemer process.

But while the iron may be, in fact must be, high in phosphorus, as the reduction of that element is depended upon to furnish the necessary heat for the process, the silicon percentage in the iron must be low, or its reduction would be disastrous to the basic lining of the converter, and otherwise render the operation impractical. So that here again only certain iron ores can be used. And as they are not plentiful in this country, the Basic-Bessemer process has not been financially successful in America—while it has been so in Europe.

Following Bessemer's invention came those of Martin and Siemens, by which

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open hearth steel is made, but the quality of this also depends on the phosphorus in the metal used, and for this and other reasons, this steel has been higher priced than Bessemer.

This is known as Acid Open Hearth steel, because the furnaces in which it is produced, while having a lining differing from that used in the acid Bessemer converter, it nevertheless produces an acid slag.

The Thomas-Gilchrist basic lining was applied to Open Hearth furnaces, and the Basic Open Hearth steel process developed. By this process, phosphorus can be eliminated, and as the range of suitable metal is much greater than either of the other named processes, its development, particularly in this country, has been very rapid, and is still progressing. Phosphorus is the great enemy of good steel; hence it is certain that if metal can be obtained low in that element, particularly if at nearly if not quite the same cost, its use should be preferred. Of course, requirements vary with conditions, and those conditions should be well understood, and careful consideration given them.

Reference has been made to the necessity for careful treatment, both in the manufacture, manipulation and fabrication of steel. While this is so well known, it is doubtful if sufficient attention is always given to it, and proper steps taken to prevent bad work. It is much easier to conduct fabrication in a loose manner, and if two holes do not come fairly opposite each other, drive in the drifting pin, and slam away until the rivet or bolt can be forced through. Treat the metal as though it were its fault that so much brute strength had to be expended. But what about the ruptures in the material which may be started? What about the strains set up, etc., etc.? And has any money been saved? A business conducted on careful, systematic lines is certain to be more profitable in the long run than one run on the slam-bang plan.

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HOW TO CONSTRUCT A TIN ROOF.

Roofs with less than one-third pitch are made with flat seams and should preferably be covered with the best kind of roofing tin, from sheets 14x20 inches dimension, rather than from sheets 20x28 inches, because the larger number of seams stiffen the surface and help to prevent buckles and rattling in stormy weather. For flat seam roof one-inch barbed and tinned roofing nails should be used, not over six inches apart, well under the edge. They should be well covered up and the seams should be pounded down over the edge with wooden mallet. Nails must never be exposed. The seams should be made with great care; sufficient time must be taken to properly "sweat" the solder into the seams.

Steep tin roofs should be made with standing seams and from sheets 20x28 inches. The sheets are first double seamed and soldered together into long strips that reach from eaves to ridge. The sloping seams are composed of two "upstands," interlocked and held in place by cleats. The standing seams are not soldered, but are simply locked together with the cleats folded in from 15 to 18 inches apart. Nails should be driven into the cleats only.

While it is always cheapest to use the best material, roofing plates with a lesser coating may be used for steep standing seam roofs. IC roofing plates, in which the iron body weighs 50 lbs. per 100 square feet, are more suitable than IX plates (62½ lbs. per 100 square feet), because the seams in the lighter plates will not suffer as much from contraction and expansion as the thicker plates.

For spouts, valleys and gutters heavily coated IX plate should always be used.

The amount of terne coating on the lighter sheets should in all cases be fully as heavy as on the heavier plates.

In late years the anxiety of some manufacturers to satisfy the demand of the people for cheap goods has been the cause of many inferior grades being introduced. This latter class of material may suit for some purposes outside of roofing or for roofs on temporary buildings, but for roofs that are expected to last, the "double dipped" and "extra coated" plates should be used.

The use of acid in soldering seams in a tin roof is to be carefully avoided; acid coming in contact with the bare iron on the cut edges and corners where the sheets are folded and seamed together will cause rusting. No other soldering flux but good rosin should be used. Every roof should be carefully cleaned and all rosin spots and detrimental substances should be removed as the tinner's work is being finished. Lumps of rosin left on the roof will melt in the sun, stick to the roof, cause blisters and prevent paint from adhering.

For valleys, spouts and gutters of a tin roof no other metal than terne plates should be used, because the galvanic action produced by different metals coming in contact with each other will cause disintegration under atmospheric influences.

The sheeting boards underlying the roofing tin should be put close together.

The wood should be well seasoned, dry and all knots should be culled out. It is also advisable to cover the boards with good building paper before the tin is laid on. The paper serves to exclude from the tin injurious vapors, gases, or fumes that continually rise from the rooms below.

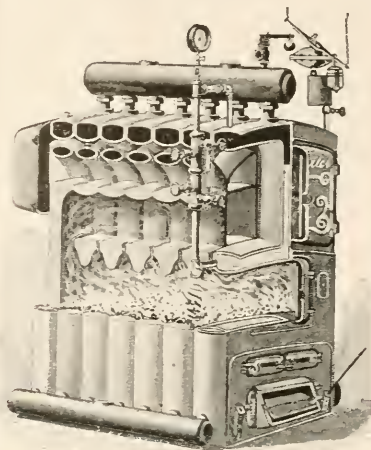
When no paper is used the tin must in all cases be painted on the under side with good reliable oil paint before it is laid and fastened on the roof. The outside should receive two coats of paint as soon as the roof is finished.

To make tin roofs last for generations they should be repainted every three to five years with good iron oxide and linseed oil paint. The frequency of the intervals will depend largely on the climatic conditions of the country.

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VACUUM HEATING.

In discussing Vacuum Heating, let it be understood that we have it under consideration only in connection with the ordinary low pressure steam heating plant, and, that we may make our argument clear, we will state a few well known facts.

Water converted into steam has its volume increased in round numbers 1,700 times. Steam condensed again to water occupies but 1-1700 part of the space that the steam filled. Should the space in which this occurred be tight there would be created nearly a complete vacuum.

Atmosphere exerts a pressure of 14.7 at the sea level. Under this pressure the boiling point of water is 212 degrees Fahrenheit.

Therefore starting a fire in our boiler and raising the temperature of the water slightly above 212 degrees we have a pressure inside our apparatus slightly greater than that of the atmosphere which by the greater force (Steam) expelling the lesser force (Air) establishes a circulation throughout our boiler, pipes, and radiators.

Now if the air which the steam has expelled is prevented from again entering the radiators, pipes or boiler, and the fire is allowed to cool down, the temperature throughout the system will fall. The vapor constantly getting more dense and occupying less space begins to form the vacuum, which increases in exact ratio as the temperature falls.

However, owing to the absence of atmosphere pressure in radiators, pipes or boiler, such heat as is generated in the boiler flows to the radiators at a greatly and ever increasing velocity, until the vapor in the boiler reaches a temperature of 70 degrees Fahrenheit.

The reader must not overlook the fact that above description refers to a tight plant. In ordinary practice a plant that will draw from 15 to 28" of vacuum is easily within the possibilities. The writer having seen a complete apparatus heated when temperature in boiler registered 102 degrees Fahrenheit and has shown a number of experienced engineers that a plant found practically without circulation and cold at 120 degrees Fahrenheit could be circulated and heated throughout at 140 degrees Fahrenheit.

The bugbear of a tight plant has no foundation in fact, as any plant that shows fairly steam tight will draw a vacuum of from 15 to 28", at which point a fuel saving of more than 25 per cent would result.

A little time spent in investigation will convince the most skeptical that the above claim is perfectly reasonable. The further fact that the heat may be controlled, and also that all danger of damage by leakage, as well as the fact that foul air from the radiators is emitted in the basement instead of into the living rooms is worthy most careful consideration. The writer is convinced that vacuum steam heating is an ideal system and is the heating of the future.

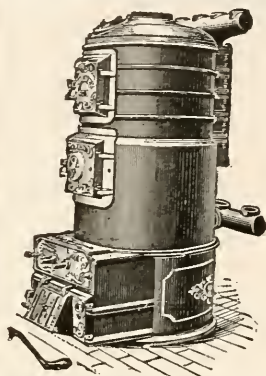
ORDINARY STEAM HEATING.

Air valves upon the radiators are important, whether automatic or not is a matter for the consideration of the user. The fact that the air must be exhausted from the radiators before the resultant heat will be present necessitates their use. If automatic, they must be properly adjusted, and in the case of dwellings some one should be instructed in their use.

As to the size of mains, Professor Carpenter says: "The area of the main pipe must in every case be equivalent in carrying capacity to that of all the branches taken off; it consequently may be reduced as the distance from the boiler becomes greater or as more branches are supplied. It will in general be found, except when large pipes are used, less expensive to run the main full size rather than to use reducing fittings."

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Find the area by multiplying the amount of radiating surface. If 1,400 feet or less, by .009; if 1,600 feet or more, by .008, and then use pipe with area nearest to that so found; thus radiating surface pipe will supply:

Diameter of Pipe.	Area in Inches.	—Radiation.—	
		Direct.	Indirect.
1¼ x 1	1.49	150	85
1½ x 1¼	2.03	225	140
2 x 1¼	3.35	350	200
2½ x 1½	4.78	500	300
3 x 2	7.38	800	500
3½ x 2	9.83	1100	700
4 x 2½	12.73	1500	1000
4½ x 2½	15.93	1800	1200
5 x 3	19.99	2400	1600
6 x 3½	28.88	3600	2200
7 x 4	38.73	5000	3000
8 x 4½	50.03	6500	4000
9 x 5	63.63	8000	5400
10 x 6	78.83	10000	7000

"In many cases where the water leaves the boiler and goes into the radiation, the trouble is caused by improper firing. If the water should disappear from the gauge glass, do not draw the fire, but cover it with wet ashes, and allow the boiler to cool before refilling with water."

HOT WATER HEATING.

Hot water heating was used very many years ago and undoubtedly with good results, but the many appliances now adopted were not then known, and the various sizes of pipes were not at hand.

In 1836 Mr. T. Bramah published a work (which was really from the pen of Mr. Thos. Tredgold in 1824, and three editions previous to this date had been issued by Mr. Tredgold), with an appendix describing an apparatus used by him in 1829 containing the features of the overhead system of to-day; he also published a description of hospital heating of the present method of installing an indirect hot water plant, in addition to which he heated for domestic uses from the same apparatus, and seems to have originated the practice of casing in the heater and circulating air over it, and passing it up through registers. He described what to-day might be considered a direct radiating hot water apparatus; in this system, he feeds the radiators on top, the return being on opposite end at bottom, connecting the expansion tank to the upper end of the flow and return mains, doing away with air valves.

Mr. Charles Hood in 1837 published a work on hot water heating, and Mr. C. J. Richardson's treatise of 1837 speaks of the methods then in use, and describes the different arrangements now adopted in continuous circulation, the rising main, the overhead falling main for supplying indirect stacks, and the overhead system, the rising main being carried to a point below the radiation on the upper floor, the radiation being supplied on the floors below from downward branches with a by-pass. He speaks of a half turn cylinder valve similar to those now in use, which also had a 3, 4, 5 and 6 way valve for controlling and diverting a number of circulations.

A diversity of opinion prevails, even now, as to the method most efficient, whether one or two pipe, the latter is generally preferred; the closed and the open tank can be used with either; in the former the expansion tank is closed and the water is carried under pressure at a higher temperature, while in the latter the water will not exceed the boiling point. The flow of water increases with the temperature, and to get economical results it should circulate at a temperature not higher than 180°, and to insure this the system should be so arranged that the heat will be taken uniformly from the heater as generated. The covering of mains in the basement is of great importance.

In the open tank system the basement piping consists of supply and return mains of the same size running parallel or with return directly under the flow pipes and pitching upward from the boiler. What is known as the trunk system consists of one supply and one return main of equal size. These are run in pairs and each radiator has supply and return of same size.

Each radiator has a valve and union ell at the opposite end of it. If one main only is used the radiators on first floor should be supplied direct and should have larger connections. Radiators on the second and upper floors can be supplied from one branch. The ends of supply and return should be larger than the supply riser.

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To find the size of mains multiply the radiating surface: When 1,800 feet and less, by .011; when 2,000 feet and over, by .009.

Size of Main.	Area.	Direct Radiation	Indirect Radiation
		Will Supply, Feet.	Will Supply, Feet.
1½ inches	2.03	200	135
2 inches	3.35	325	200
2½ inches	4.78	450	300
3 inches	7.38	700	450
3½ inches	9.82	900	600
4 inches	12.73	1200	800
4½ inches	15.93	1500	1000
5 inches	19.99	2000	1200
6 inches	28.88	3000	2000
7 inches	38.73	4200	2800
8 inches	50.03	5600	3600
9 inches	63.63	7000	4600
10 inches	78.83	8500	5600

In the case of water being used, an expansion tank is necessary, for as the temperature of water rises until at the boiling point it is 5 per cent. greater than at 40 degrees the increase must be provided for, so that when cooled the system will still be full of water. It should be placed at a point above the highest radiator, the supply and return to it being connected to the supply and return of the nearest radiator, at a point below the radiator connection. No valves should be placed at any point that can possibly close the connection between the boiler and the tank.

To find the size of tank in gallons required, multiply the square feet of surface in the radiators, if the amount is less than 1,000 square feet, by .03; between 1,000 and 2,000 square feet., by .025; over 3,000 square feet, by .02.

An altitude gauge placed near the boiler will save watching the expansion tank. Fill the expansion tank to a point half way up the glass, and set the red hand of the gauge to indicate that point, and the movement of the movable hand will indicate the relative position of the water in the tank.

In the matter of radiation, the surface required is most important. In all cases the radiators should be placed as near the windows or outside exposures as possible. Low and curved window radiators add to the cost. Conditions vary considerably and must enter into the calculations of amount of radiation necessary. Glass exposure, wall exposure, cubic contents, location, exposure and construction of building must all be taken into account.

Ascertain the dimensions of room, the number of square feet of glass surface in windows and outside doors, figuring these doors as if glass, and measuring the entire opening of windows and door-frames. Ascertain the square feet of exposed wall surface, and deduct the glass surface as obtained above, and this will be the net amount of wall exposure. Reduce the wall surface to the equivalent of glass surface by dividing the net amount of wall exposure by 10 if the wall is from 8 to 10 inches thick, by 15 if from 12 to 26 inches thick, and by 20 if the wall is 26 to 38 inches thick. This result, added to the glass exposure, gives the glass equivalent of the glass and wall exposure. Multiply this glass equivalent by 75 (the cubic feet of air that each square foot of glass will cool per hour), and the product is the cubic feet of air to be heated to overcome the cooling effect of the glass and wall exposure. Now add to this the cubic contents of the room, and we have the total quantity of air to be heated.

It is customary to guarantee a temperature of 70 degrees in zero weather. To arrive at the amount of radiation under this guarantee multiply the quantity of air to be heated by the decimals given below, and the product will give number of feet required.

In localities where the temperature falls below zero, add to the amount of radiation obtained 1 per cent. for every degree below zero.

For Hot Water.—For temperature of water in radiators, 160 degrees, multiply by .0092; water in radiators, 170 degrees, multiply by .0081; water in radiators, 180 degrees, multiply by .0072.

For steam multiply by .0055.

For water use the multiple .0092; for if water is 175 degrees in flow and 145 degrees in return, the average is 160 degrees in radiation.

This is based upon using direct radiation, and provides for one change per hour. For more frequent changes increase the cubic contents by as many times as it is desired to change the air, the multipliers remain the same.

Direct radiation is surrounded by warm air, but cold air comes in contact more or less with their surfaces, in direct-indirect and indirect systems, so that for direct-indirect add 25 per cent. and for indirect 50 per cent.

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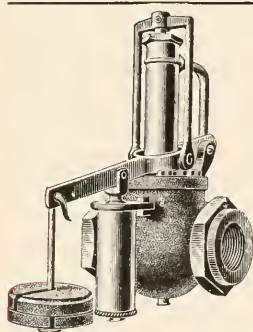
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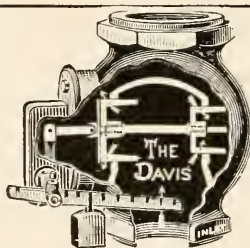
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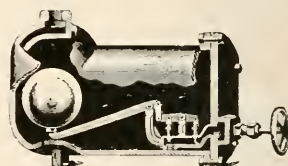
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EXAMPLE FOR DIRECT RADIATION.

Room— 16 feet wide, 20 feet long, 10 feet high.
 4 windows, 3 feet wide, 5 feet high.
 2 sides of room exposed to 0° weather.
 10 inches thickness of wall.
 $16 \times 20 \times 10 = 3200$ cubic feet of air in room.
 $3 \times 5 \times 4 = 60$ square feet of glass in windows.
 $16 + 20 \times 10 = 360$ square feet of wall surface exposed, including glass.
 $360 - 60$ (glass) = 300 square feet actual amount of exposed wall surface.
 $300 \div 10 = 30$ — glass equivalent in wall exposure.
 $30 + 60 \times 75 = 6750$ — air in cubic feet cooled by windows and walls.
 $3200 + 6750 = 9950$ — total in cubic feet of air to be heated.
 $9950 \times .0055$ (multiplier for steam) = 54.72 radiation in square feet required to heat room.

Indirect radiation is adopted where a large amount of ventilation is desired. It is particularly necessary in schools, hospitals and churches, and in dwellings one or two indirect stacks are desirable. This method of heating is decidedly more expensive than all direct radiation, and consumes more coal. It is frequently used in combination with direct radiation, and in this case ventilating flues must be provided. Either fireplaces or special flues from each apartment so warmed to the open air, and these flues (as well as from those conducting heat) must be placed in inside walls or partitions.

In installing this system the heating stacks are placed in the basement, connected to main supply and return pipes and encased with either galvanized iron, or narrow ceiling lined with tin. The cold air is introduced through air ducts from the outside, and after being warmed by contact with the indirect heating surfaces, is introduced into the rooms through tin flues and registers.

It is a mistake to select a boiler of exactly sufficient capacity to carry the amount of radiation required to heat the building. The mains and risers must be considered radiating surface, and must be allowed for. The boiler should have a capacity of at least 20 per cent. in excess for direct work, for direct-indirect 25, and for indirect 50 per cent. It is important to know at what temperature a boiler will circulate the water in the radiation it is supposed to carry. Ratings of boilers in this particular seem to be lacking in information.

Mr. A. C. Mott, in his paper read in 1897, before the Am. Soc. of H. and V. Engineers, says:

"The amount of heat given off by radiation depends upon the difference between the temperature of the air in the room and that of the radiator. There are practically two units given off per hour from each square foot of radiation per degree difference between the temperature of the air in the room and that of the radiator, when the difference is 150 degrees. From this may be determined what percentage must be added to steam radiation to heat the space with water to any desired temperature."

"To illustrate: Steam at two pounds' pressure makes the temperature of the radiator 220°; deduct temperature of the room, 70°, and we have 150° as difference, which, multiplied by 2, gives 300 heat units. (A thermal unit is the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit. One pound of coal completely burned will give from 13,000 to 14,000 thermal units. In an ordinary steam boiler from 6,000 to 8,000 units are utilized in the production of steam, the rest being lost in one way or another. The amount of force in one thermal unit will raise 772 lb. one foot high, or is equal to 772 foot pounds. At the average temperature and pressure, a little over 13 cubic feet of air make one pound. If completely burned, one pound of coal requires about 300 cubic feet of air. A column of air one inch square extending from the ground to the top of the atmosphere weighs about 14.6 lb. When air is heated it expands and in doing so will weigh less than it did before. It expands 1.491 of its bulk at 32° F. for every degree it is heated.) The difference between water at 160° and the room at 70° is 90°, which multiplied by 2 equals 180 heat units as the heat given off per square foot, as against 300 heat units by steam at 220°, a difference of 70 per cent., consequently 70 per cent. more radiation will be required to heat the space with water at 160° than with steam (or water) at 220°. A boiler rated at 600 ft. for steam would carry 1,020 ft. of water radiation at 160°. In heating a building from zero to 70° (or from and to any other temperature) a certain number of heat units are required to warm and overcome the cooling effects of glass, wall and other exposures, and that the quantity is constant; that is, the number of heat units is always the same, no matter what the temperature of the radiation, whether 220° or 160°."

The measure of work for a high pressure boiler is the horse power. By horse power is meant the evaporation of a certain amount of water, a cubic foot of water at 60° evaporated to steam is equal to one nominal horse power, which in round numbers would be 70,000 thermal units. Tredgold allows 8 lb. of coal per hour, per horse power, and 300 cubic ft. of air for the combustion of each pound of coal. For low pressure or house



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heating the square foot of radiation is used. The efficiency of both being their ability to evaporate water and the one evaporating the greatest quantity from a certain temperature with the least fuel is the most economical.

The usual method adopted is to provide enough radiation to give 70° in zero weather. It is expected that 3 lb. pressure upon the gauge should be generated with 4 to 5 lb. of coal per hour per square foot of grate surface. This may not be achieved on account of poor fuel, defective draught, lack of boiler capacity and want of perfect arrangement of heating surface in the boiler.

A very essential adjunct to the working of a plant is the chimney flue, and the form of the flue has much to do with its effectiveness; thus as gases ascend in a spiral motion a round flue is the best, and a square one is better than one of rectangular shape. If of brick it should be evenly plastered. The flue should extend below the smoke pipe connection only a short distance to permit the removal of soot, if continued far below it will form an air pocket and cause down currents.

. SIZES FOR CHIMNEYS.

Square Feet of Direct Steam Radiation.	Horse Power.	Size of Chimney.	Square Feet of Direct Water Radiation.
250	2.5	8 x 8	400
500	5.0	8 x 12	850
800	8.0	12 x 12	1350
1400	14.0	12 x 16	2400
2200	22.0	16 x 16	3700
3500	35.0	16 x 20	5900
5500	55.0	20 x 20	9300
8000	80.0	20 x 20	13000

The ventilation of rooms is a very important factor. A certain amount of space is necessary to provide change of air, the circulation of which is of more importance than is generally attached to it, in this respect the indirect system of heating is advocated.

In theaters, churches, etc., provision should be made to admit from 400 to 1,500 cubic feet of air per hour for each person. In school rooms children should be provided with 600 cubic feet, and grown persons 1,200 cubic feet of air per hour. The Massachusetts law requires 30 cubic feet of fresh air per minute for each pupil, or 1,800 cubic feet per hour. This requirement represents the most advanced American practice. From 2,000 to 3,000 cubic feet of air per hour per occupant is required in hospitals and workshops. Each cubic foot of gas burned for illumination will consume from 8 to 12 cubic feet of air per hour.

The number of respirations men take on an average is 20 per minute, the volume of the air inhaled at each inspiration is equal to 40 c. inches. The atmosphere of a lighted room containing several persons is vitiated to such an extent as to require a supply of fresh air equal to 4 c. feet per minute for each.

Main supply pipes should run from top of boiler with a rising inclination of about $\frac{1}{4}$ inch to 10 ft.

A cubic inch of water at 212° becomes very nearly a cubic foot of steam at the same temperature, expanding as it does into 1,696 times its volume.

Radiation for steam weighs about 7 lb. per sq. ft.: for hot water, about 7 $\frac{1}{2}$ lb.

The circulation of the air is of more importance than is generally attached to it, and the indirect system by means of which fresh heated air is introduced is to be advocated. Fire places are of great use for purposes of ventilation.

The use of heat regulation has grown so common that it has necessitated the manufacture of many different forms of thermostats to meet the requirements of the heating plans, and also of many designs of covers for thermostats to meet the tastes of various users. There are many artistic designs, plain and ornamental. Architects should specify the kind of thermostat to cover they desire.

CAST IRON BOILER CONSTRUCTION.

The demand for steam and hot water heaters of cast iron construction has so materially increased in the last few years that numerous types setting forth various ideas advanced by manufacturers have been placed on the market. In fact, the many varieties to-day have become the source of considerable annoyance to the architect in determining the best makes. The aim on the whole has been to specify a boiler which when in use has proven the most satisfactory and is theoretically and practically constructed.

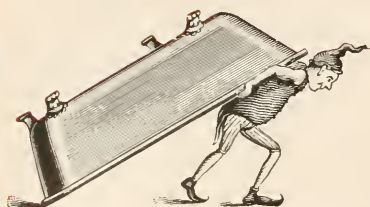
Of the many boilers on the market there are a few which appear to be in advance of others, being constructed along lines which recent developments have proven to be necessary to meet present requirements.

It is far from our intention to describe any particular boiler or line of boilers. We do wish, however, to set forth our ideas regarding good cast iron boiler construction—a construction which, in our opinion, will give the best results in each of the many requirements.

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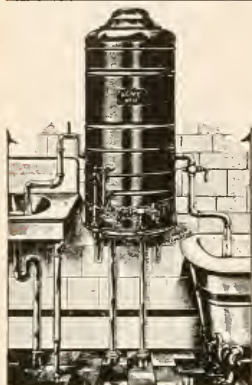
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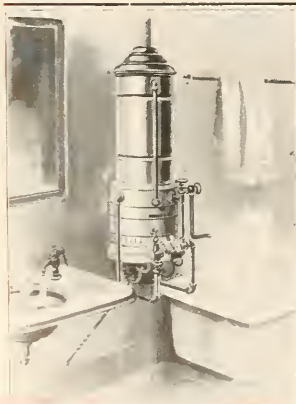
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STYLE.—We believe it is unnecessary to dwell upon the different types of construction known as horizontal, sectional or vertical sectional boilers. The more progressive are to-day considering the use of only such goods as have been demonstrated to be thoroughly, practically and theoretically far in advance of the boilers used in the past.

GRATE SURFACE.—One of the most essential features to be considered in selecting a heater is the comparative area of grate surface for the duty required, as well as to the fire surface contained in the boiler. The vast and varied ideas regarding the proportioning to grate area are such as to confuse many users of heaters.

Experience has taught only one ratio. Inexperience has placed many. The one ratio is not a fixed ratio, but varies according to the increase and decrease of fire surface. The manufacturer is more inclined to use a ratio which will meet his requirements in cheaply manufacturing his product—a fact which the architect should not lose sight of in specifying a heater.

A simple rule which should suffice under all ordinary circumstances, we here give:

With 80 ft. or less fire surface, 1 ft. grate surface to not less than 15 ft. fire surface.

From 80 to 130 ft. fire surface, 1 ft. grate surface to not less than 20 ft. fire surface.

From 130 to 200 ft. fire surface, 1 ft. grate surface to not less than 22 ft. fire surface.

From 200 to 300 ft. fire surface, 1 ft. grate surface to not less than 30 ft. fire surface.

From 300 to 400 ft. fire surface, 1 ft. grate surface to not less than 35 ft. fire surface.

The fire surface found in boilers on the market is of such construction as to give varied efficiency. In choosing boilers one should aim to secure the greatest amount of direct surface available, still retaining sufficient indirect surface to reduce the temperatures of the gases sufficiently. The surface should be such as to permit the direct ray of heat to strike as much surface as possible in order that the surface may be self-cleaning and sensitive to the heat even with the cheaper grades of fuel. Fire surface should be of sufficient quantity to be capable of warming the radiation required, regardless of the manufacturer's rating of the boiler.

The water way should be of such construction and capacity as to be easily affected by heat, as well as a construction which will permit, in fact, compel a positive circulation of the water within the boiler. The water way should be such that it will be impossible for the water to foam from friction or violent ebullition. These results can only be obtained by the use of inclined water ways which permit the steam to ascend on one side of the water way, allowing the water to freely take the place of that generated into steam and in circulation.

The water way should be of sufficient capacity to generate sufficient steam to fill the system both with steam and supply the water of condensation usually attending the operation of a steam plant without lowering the water line in the boiler below any portion of the fire surface. The evaporating surface should be of sufficient area to permit of the tranquil release of steam with circulation within the boiler to positively prevent any possibility of priming, thus securing a steady water line.

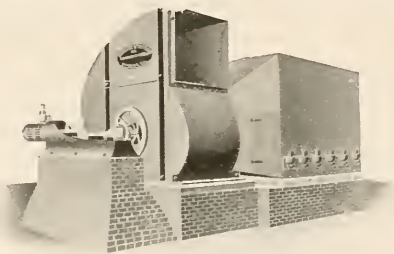
GRATE.—The grate should be constructed of one-half iron and one-half air space, with only sufficient metal to prevent warping caused by weight of fuel, the less metal employed, providing the same is properly protected by air, the less liable the grate to warp or become burnt. The grate should be so constructed as to permit of an exceptionally large portion of air at the outer portion of the fireplace. The sections of the boiler should then be separated or of such construction as will enable the air to come in contact with the outer portions of the fuel much more readily than the center, producing an even fire throughout, thus doing away with dead parts along the edge and in the corners of the boiler. A grate thus constructed is superior, inasmuch as it can be better proportioned to the fire surface and at the same time permit the fuel to give equal or better results.

The absence of horizontal surface in the construction of the boiler is a very important feature inasmuch as it overcomes the general cause of uneven expansion, avoiding breakage, the temperature of sections always being controlled by the temperature of the water and not by the temperature of the fire.

The thickness of the metal should be from one-quarter to three-eighths of an inch, according to the size of boiler, as practical use has demonstrated the above thickness of metal to be correct.

SOME OF THE REQUISITES FOR GOOD STEAM BOILERS.

- (1) Best material for this purpose, simple construction, perfect workmanship.
- (2) A mud-drum to receive impurities deposited from the water, in a place removed from action of fire.
- (3) A steam and water capacity sufficient to prevent fluctuation in pressure or water level.
- (4) A large water surface for the disengagement of the steam from water in order to prevent foaming.
- (5) A constant and thorough circulation of water throughout the boiler, so as to maintain a uniform temperature.



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(6) An excess of strength over any legitimate strain. No joints exposed to the direct action of fire.

(7) Combustion chamber so arranged that combustion of gases may be as complete as possible.

(8) The heating surface at right angles to the currents of heated gases.

(9) All parts of the boiler readily accessible for cleaning and repairs.

(10) Very best gauges, safety valves and other fixtures.

PIPE COILS.

When a pipe coil or cast-iron section is introduced into the firepot for the purpose of heating water for domestic use, additional capacity should be figured in determining size of boiler, viz., $1\frac{1}{4}$ square feet for steam and 2 square feet of direct radiation for each gallon of water to be thus heated, according to the capacity of the tank to which coil or section is connected.

FORMULA FOR CALCULATING RADIATION.

The following is successfully used by a prominent member of the C. A. B. A.:

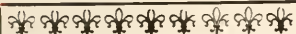
First ascertain the cubical contents, glass surface (which includes the surface of all exterior doors and windows), take into account whether N., S., E. or W.

Let "I" be the inside temperature desired, say 70° Fahrenheit, "E" the coldest exterior temperature, "V" volume of room in cubic feet, "W" exterior wall surface of room in square feet, "G" exterior windows and doors in square feet, "R" standard amount of surface radiation in square feet, "F" factor depending upon method of heating or particular story heated. When hot water overhead system is used: 4 story building, adopt 1.3 for first story, 1.2 for second, .90 for third and .60 for fourth. In 3 story buildings, 1.25 for first, 1 for second and .75 for third. For 2 story, 1.2 for first and .8 for second.

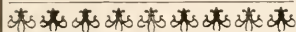
When the steam heating method is used, "F" becomes a constant equal to .8. "J" factor depending upon exposure equal to 1.4 for N., W. and N. W. exposures, equal to 1.2 for N. E. and S. W. exposures, equal to 1 for E., S. and S. E. exposures, and also for small interior courts and places well protected from north and west winds. For bath-rooms where a higher temperature is usually desired J is often made 2 instead of the usual rule. Kitchens where coal ranges are used, "J" is often made as low as .5, usually .75; but where there are no coal ranges "J" should be made 1-10 less than the factor obtained for the above.

$$\left\{ \frac{V}{400} + \frac{W}{10} + \frac{G}{2} \right\} \left\{ \frac{I-E}{I} \right\} .9 = R.$$
 Q equals the desired square feet direct radiation surface for a room. $Q = R F J.$ "E" is usually taken as 10° higher than the minimum recorded temperature of the locality. "I" is taken as 70° , therefore the quantity $\left\{ \frac{I-E}{I} \right\} .9$ becomes a constant for any given locality, for Chicago where the minimum temperature is minus 20° the quantity is taken at 1.03.

The diameter of all supplies in inches should not vary materially from the square root of the (amount of radiation to be supplied by the pipe, divided by 100). This rule is equally applicable to the supply of a single radiator or the supply of an entire system. Good judgment must go with the use of all empirical formula, especially in the use of the factor "J," which might be called the judgment factor. Location of surrounding buildings, trees, open space, etc., should be considered in the selection of a value for "J."



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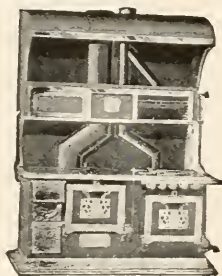
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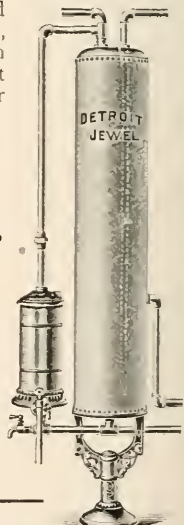
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MANUFACTURED GAS FOR LIGHT.

The following tables show the proportionate size and length of tubing allowed:

Size of Tubing.	Greatest Length Allowed.	Greatest Number of $\frac{3}{8}$ " Openings Allowed.	Size of Tubing.	Greatest Length Allowed.	Greatest Number of $\frac{3}{8}$ " Openings Allowed.
$\frac{3}{8}$ inch	20 feet	2 openings	$1\frac{1}{2}$ inch	150 feet	60 openings
$\frac{1}{2}$ inch	30 feet	3 openings	2 inch	200 feet	100 openings
$\frac{3}{4}$ inch	60 feet	10 openings	$2\frac{1}{2}$ inch	200 feet	200 openings
1 inch	70 feet	15 openings	3 inch	300 feet	300 openings
$1\frac{1}{4}$ inch	100 feet	30 openings			

Drops in double parlors, large rooms and halls of office buildings must not be less than $\frac{1}{2}$ inch.

STORES, HOSPITALS, SCHOOLS, FACTORIES, ETC.

MANUFACTURED GAS FOR LIGHT.

Size of Tubing.	Greatest Length Allowed.	Greatest Number of $\frac{1}{2}$ " Openings Allowed.	Size of Tubing.	Greatest Length Allowed.	Greatest Number of $\frac{1}{2}$ " Openings Allowed.
$\frac{1}{2}$ inch	20 feet	1 opening	$1\frac{1}{4}$ inch	100 feet	20 openings
$\frac{3}{4}$ inch	60 feet	8 openings	$1\frac{1}{2}$ inch	150 feet	35 openings
1 inch	70 feet	12 openings	2 inch	200 feet	50 openings

For stores the running line to be full size to end of last opening.

All drops to be $\frac{1}{2}$ inch with set not less than 4 inches.

Twenty feet of $\frac{3}{8}$ -inch pipe allowed only for bracket lights.

BUILDING SERVICES.

In running service pipe from front wall to meters the following rules will apply:

Size of Opening.	Greatest Length Allowed.	Greatest Number of $\frac{3}{4}$ " Openings Allowed.	Size of Opening.	Greatest Length Allowed.	Greatest Number of $\frac{3}{4}$ " Openings Allowed.
1 inch	70 feet	1 opening	$1\frac{1}{2}$ inch	150 feet	5 openings
$1\frac{1}{4}$ inch	100 feet	3 openings	2 inch	200 feet	8 openings

All openings in service must be equal to the size of riser, which in no case must be less than $\frac{3}{4}$ inch.

MANUFACTURED GAS FOR FUEL.

Size of Tubing.	Greatest Length Allowed.	Greatest Number of $\frac{3}{4}$ Openings Allowed.	Size of Tubing.	Greatest Length Allowed.	Greatest Number of $\frac{3}{4}$ Openings Allowed.
$\frac{3}{4}$ inch	50 feet	1 $\frac{3}{4}$ -in. or 2 $\frac{1}{2}$ in.	$1\frac{1}{2}$ inch	150 feet	7 or 4 $\frac{3}{4}$ -in. and 6 $\frac{1}{2}$ -in.
1 inch	70 feet	2 or 1 $\frac{3}{4}$ -in. and 2 $\frac{1}{2}$ in.	2 inch	200 feet	15 or 8 $\frac{3}{4}$ -in. and 14 $\frac{1}{2}$ -in.
$1\frac{1}{4}$ inch	100 feet	4 or 2 $\frac{3}{4}$ -in. and 4 $\frac{1}{2}$ -in.			

For mantels, grates and small heating appliances, for heating space not to exceed 1,728 cubic feet, thirty feet of $\frac{1}{2}$ -inch pipe is allowed for one opening only, and two such openings are considered as one $\frac{3}{4}$ -inch opening.

FOR GAS ENGINES.

Size of Engine.	Size of Opening.	Greatest Length Allowed.	Size of Engine.	Size of Opening.	Greatest Length Allowed.
1 H. P.	1 inch	60 feet	7 H. P.	$1\frac{1}{2}$ inch	100 feet
2 H. P.	$1\frac{1}{4}$ inch	70 feet	12 H. P.	2 inch	140 feet
5 H. P.	$1\frac{1}{2}$ inch	100 feet			

Supply for gas engine must be separate, and an independent service will be required.

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One Block West of Halsted St.

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CHICAGO, ILL.

VICTOR E. JOHNSON

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SUPERIOR IRON WORKS

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Manufacturers of All Kinds of

**IRON WORK FOR
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Fire Escapes, Anchors and Stirrups, Truss Rods,
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CHICAGO

Hammill Fire Escape Co.

GET OUR ESTIMATE.

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M. E. BALDWIN

SUCCESSOR TO BALDWIN & SNYDER

MASON CONTRACTOR

POWER PLANTS
A SPECIALTY

Boiler Setting, Smoke Stacks, Furnace and Engine Foundations
Room 1651 Marquette Building, 204 Dearborn Street.

CHICAGO

NATURAL GAS FOR FUEL.

Classification of Appliances.	Size of Openings.	Greatest Length Allowed.
Small portable gas cooking stove.....	1/2 inch	20 feet
Small portable gas heating stove.....	1/2 inch	20 feet
Kitchen boiler heater when separated from range.....	1/2 inch	20 feet
Miscellaneous appliances consuming less than 15 cubic feet per hour each	1/2 inch	20 feet
Gas cooking ranges	3/4 inch	30 feet
Ordinary coal ranges, equipped for the use of gas.....	3/4 inch	30 feet
Large heating stoves	3/4 inch	30 feet
Gas logs or other grate fires	3/4 inch	30 feet
Miscellaneous appliances consuming 15 to 40 cubic feet of gas per hour each	3/4 inch	30 feet
Miscellaneous appliances consuming 40 to 75 cubic feet of gas per hour	1 inch	60 feet
Hot air furnaces for heating 10-room buildings or less.....	1 1/4 inch	70 feet
Hot air furnaces for heating 10 to 15-room buildings.....	1 1/2 inch	100 feet
Low pressure steam or circulating water boiler for heating 10 rooms or less	1 1/2 inch	100 feet
Low pressure steam or circulating water boiler for heating 10 to 15-room house	2 inch	140 feet
Low pressure steam or circulating water boiler for heating 16 to 26-room houses	2 1/2 inch	200 feet
Low pressure steam or circulating water boiler for heating 27 to 50 rooms	3 inch	300 feet
Low pressure steam or circulating water boiler for heating 50 to 80 rooms	4 inch	400 feet
For special purposes not provided for above, apply to the company's inspector for information.		

SUMMARY.

1. All branches or cross lines of pipe from the main line must have a set not less than 4 inches dropped square, and must be well secured to joist by gas hooks or straps.
2. All openings must be closed with iron caps, no split pipe or broken fittings repaired with cement or lead will be allowed.
3. All drops on branch lines and openings for side brackets must be square bends; no nipples allowed.
4. The risers in all buildings must be carried up an inside partition out of reach of frost and must be placed where the meter and stop cock can be readily got at. Vestibules not to be considered as inside partitions.
5. To avoid trapping, gasfitters must grade all pipes to riser or drops.
6. In no case will a meter be set where it is not easily accessible, or where it is exposed to frost and dampness, or liable to injury from any cause.
7. All pipe for fuel must be run independent, and connected to light riser at meter end, with right and left, union, or running thread.
8. Supply for gas engines must be separate, and an independent service will be required.
9. Drops in churches, schools, public halls, stores, double parlors, large rooms, etc., must not be less than 1/2 inch.
10. No riser in any building must be less than 3/4 inch and in stores must not be under deck of show windows, as meter will not be set there.
11. The riser in any building must not be less than 20 inches from the floor for two to ten openings; 2 feet 6 inches for ten to thirty openings; 4 feet for thirty to sixty openings; 5 feet for sixty to one hundred openings; 6 feet for over one hundred openings.
- Where meters are to be set on wall, no riser must be higher than 9 feet from floor.
12. In all cases where extensions are made, care must be taken to break pipe where the rule for size can be maintained, and in no case shall extension be made from small pipes.
13. In flat buildings meters should be set in basement or in room provided for meters; otherwise in premises where gas is consumed.
14. All risers and building services must be brought to front of building and within 18 inches of wall or partition, and must not be less than 15 inches apart where risers are grouped.
15. In all cases where building service is used, provide header with an opening for each riser; where risers are in groups, openings must not be less than 15 inches apart.
16. Underground work by gasfitters between main and meter will not be allowed or accepted.

17. To avoid complications, gasfitters should consult this Company before locating risers in corner buildings.

18. In flat buildings where appliances are installed for the joint use of tenants, such as laundry stoves, driers, etc., run pipe from each meter to laundry and provide a header for a lock cock for each tenant. Fasten securely to each cock a metal tag with the flat number plainly marked thereon.

In cases where one common riser is desired, locate header in laundry and provide lock cocks and tags as provided above.

19. All work must be proved with mercury gauge, not less than a 6-inch column of mercury being allowed.

20. All pipe must be examined by the inspector of this company before being concealed, and twenty-four hours' notice must be given by gasfitters when any pipe is ready for inspection.

21. If the rules concerning the size of pipes are not clearly understood in each case, or if unusual conditions are met with, which the rules do not cover, communicate with the company's inspector.

22. It is the purpose of the company to strictly enforce the above rules, and no certificate of inspection will be given when they are not complied with.

23. Architects, builders and owners of buildings are requested not to allow a bill for gasfitting unless accompanied by a certificate of inspection.

SPECIFICATIONS.

LOW PRESSURE STEAM AND HOT WATER CIRCULATING BOILERS.

1. Use two-inch cast-iron burner with flattened mouthpiece. For water-leg boilers use this style with a mouthpiece at an angle of 45 degrees, and set so that the mouth of the burner is about three inches above the grate line, and about three inches from side of fire box and from 8 to 10 inches center to center. For return tubular boilers use the straight burners with flattened mouthpiece set at right angles to the length of the boiler, and from 9 to 12 inches below the shell. For each of the above styles of burners use mixer, having flaring opening for the air and a wire screen covering for the air and gas openings.

NOTE.—Special combinations of these two styles of burners can be used to advantage for certain types of boilers. We would recommend consultation with the company's representatives in all special cases.

2. The burners and valves should be arranged so that the first valve will control one burner only, the second valve two burners and remaining valves not over four burners each. On the reaches from the header supplying the burners, use $\frac{1}{2}$ -inch globe valve for one burner, $\frac{3}{4}$ -inch for two burners, and 1-inch for all over two burners.

3. Drill mixer-pins for the single and double burners, 3-16 inch each. Drill mixer-pins for balance of the burners, 7-32 inch each.

4. Place sheet-iron across the fire box between the mixers and the top of the burners in such a manner as to exclude air from the fire box, except what passes through the mixers. Do not place sheet-iron across opening to ashpit.

5. The header must be the full size of the pipe leading to the boiler, as specified in the Company's rules for piping for natural gas. Do not take the supply pipe for any other appliances off the header supplying the boiler.

6. There must be a globe valve on the main line leading to the header within easy reach, which can be used to entirely shut off the supply of gas from the header. This valve should be left wide open when burners are used, and the gas supply controlled by the small valves in front of boiler.

7. There must be a union between the first valve on the header and the nearest fitting on the pipe, and a union on each reach between the valve and the burners.

8. Do not put in pilot lights. They are unnecessary unless a regulator is used. If a regulator is used, the pilot lights will be put in by the regulator company at the time the regulator is installed. If a regulator is ordered, specify that there must be a mixer on each pilot light.

HOT WATER HEATERS.

For water heaters with circular fire pots, such as the Wilks, Tobasco, etc., or for small hot water circulating boilers, use the same equipment as for ordinary hot air furnaces, except that if Vulcan burner is used it should be covered with about 6 inches of broken firebrick.

HOT AIR FURNACES WITH CIRCULAR FIRE POTS.

Use the Claybourne Improved Cross Burner, with auxiliary, or the Vulcan Round Sectional Burner, with mixers which have flaring opening for air and wire screen covering both air and gas openings.

DIRECTIONS FOR INSTALLING CROSS BURNERS.

1. Set the burner with bottom of burner on grate line. Put mixer for the main burner on horizontal pipe, using a 10-inch nipple between the mixer and the ell turning

up toward the burner. Drill opening in mixer-pin $\frac{1}{4}$ inch. Place the mixer for the auxiliary burner on the vertical pipe and drill the mixer-pin No. 19 Morse drill. Place the iron deflector, furnished with burner, on top of auxiliary burner, leaving not less than 2-inch space all around between deflector and fire pot. If space is greater than 5 inches, extend deflector with firebrick.

2. Sheet-iron must be placed between the mixers and the burners in such a way as to entirely exclude air from the fire pot, except what passes through the mixers.

3. Make header for furnace same size as run to the furnace, with 1-inch opening for main burner, and $\frac{1}{2}$ -inch opening for auxiliary burner.

4. Use 1-inch globe valve for main burner and $\frac{1}{2}$ -inch globe valve for auxiliary burner.

5. There must be a globe valve on the main line leading to the header within easy reach, which can be used to entirely shut off the supply of gas from the header.

6. There must be a union between the first valve on the header and the nearest fitting on the pipe.

7. Do not use pilot lights. They are unnecessary unless a regulator is used. If a regulator is used, the pilot lights will be put in by the regulator company at the time the regulator is installed. If a regulator is ordered, specify that there must be a mixer on each pilot light.

DIRECTIONS FOR INSTALLING THE VULCAN ROUND SECTIONAL BURNER.

1. Burners from 14 to 18 inches in diameter must be of at least three sections, with a separate $\frac{1}{2}$ -inch globe valve controlling the supply of gas to each section.

2. Burners 20 inches in diameter or more must be of at least four sections, with a separate $\frac{1}{2}$ -inch globe valve controlling the supply of gas to each section.

3. Burners should be placed so that the outside rim of the burner will be not less than 1 inch, or more than 2 inches, from the sides of the fire pot.

4. Burners should be placed from 2 to 6 inches above bottom line of fire pot.

5. There must be a globe valve on the main line leading to the header within easy reach, which can be used to entirely shut off the supply of gas from the header.

6. There must be a union between the first valve on the header and the nearest fitting on the pipe.

7. Sheet-iron must be placed between the mixers and the burners in such a way as to entirely exclude air from the fire pot, except what passes through the mixers, and should be not less than 2 inches below the burner.

8. Make openings in the mixer-pins for each section of the burner the size of No. 19 Morse drill.

9. Mixers must be put on the vertical pipes under the burner, and not on the horizontal pipes from header to ashpit.

10. Do not use pilot lights. They are unnecessary unless a regulator is used. If a regulator is used, the pilot lights will be put in by the regulator company at the time the regulator is installed. If a regulator is ordered, specify that there must be a mixer on each pilot light.

HOT AIR FURNACES WITH SQUARE FIRE BOXES.

For furnaces having a square fire box use the Claybourne box burners, or the Holland box burner. Cover with 4 to 6 inches broken firebrick. Pieces of firebrick should be about the size of fist. These burners should be set about 6 inches from center to center, with a separate valve controlling the supply to each burner. Drill the mixer-pins for either of these styles of burners, No. 19 Morse drill.

NOTES.

1. The above specifications are the result of careful experiments made by the company with a view to determining the kind of burners and arrangement which give satisfactory and economical results. The company does not assume any responsibility for the work of gasfitters, but will send competent inspectors, if requested, to examine burners and equipment and will give the benefit of the judgment of these inspectors to consumers, without charge.

2. It is of the utmost importance in all cases that there should be dampers which will effectually control the draft and remain set in any position desired. The pipe leading to the chimney and the chimney flue should be examined and cleaned. Too much draft is expensive, because of the waste of heat up the chimney. Too little draft causes imperfect combustion and a bad odor from the products of combustion in the basement and throughout the house. Good dampers and proper adjustment of them are as important as good burners.

3. As Natural Gas is becoming more and more generally used in all kinds of appliances, it frequently happens that special forms or arrangements of burners are necessary. The company's representatives will be pleased to consult with gasfitters or customers in regard to what form of equipment would be most likely to give satisfactory results in any special cases.

EDISON

Central Station Service

FOR

Light and Power

THE MODERN METHOD

Chicago Edison Company

TELEPHONE
MAIN 1280

Edison Bldg., 139 Adams St.

REGULATIONS GOVERNING CHICAGO EDISON COMPANY'S SYSTEM.

INSPECTION.

All wiring which is to be connected to the mains of this company must be installed in accordance with the requirements of the City Electrical Inspection Bureau. A certificate of inspection or a temporary current permit must be presented at the district office of the Inspection Department of the company before current can be turned on any wiring on which a certificate has not previously been issued.

When wiring has been installed for additional light or power, a certificate of inspection must be secured and presented as in the case of an original installation, before current can be supplied.

Notice must be given to the Company whenever any additional apparatus consuming current is desired to be connected, to avoid interruption to the service and injury to the Company's meters or other apparatus.

The company will make the final connections of consumer's wiring to its mains in all cases.

METERS.

The contractor must provide loops in a conveniently accessible location, so placed that meters can be put up without altering the arrangement of wiring and permit a neat meter installation to be made. If no place is available on which meters can be fastened by wood screws, a suitable board must be provided of such size that a recording watt meter and maximum demand meters may be mounted thereon. Two demand meters are installed on three-wire lines.

For installations in which the equivalent of 24 16 c. p. lamps, or less, is to be carried on one meter, a two-wire meter will be installed and a two-wire main will therefore be allowable.

A pressure wire tap must be brought out if all the wires of the main are not looped out.

Meter loops must not be placed above six feet from the floor, and room must be allowed above and in front of meters sufficient to allow the case of the watt meter to be removed, and the demand meter to be set back.

Meter loops must be so placed that the meter will be protected by the fuses designed to protect the mains in which the meter is placed.

In office and apartment buildings meter loops should be grouped at central points in public halls or basement to save tenants expense and annoyance.

CUT-OUTS.

All cut-outs on circuits carrying 15 amperes per wire, or less, must be of the Edison plug type and must be equipped with plugs of the proper size when installed.

Cut-out centers must be located in accessible places, and if possible near the meter. Strip cut-outs are preferred for circuits carrying over 15 amperes per wire.

SOCKETS.

All sockets must be Edison base, as all lamps supplied as renewals are Edison base.

SERVICES.

The contractor must extend his wiring to the nearest service if there is one within 50 feet of the building in which the wiring is to be installed. A cut-out must be installed at the service, together with sufficient wire to allow of a soldered connection being made.

If no service is found within 50 feet, application should be made to the Inspection Department of the company to have service installed.

In case any excavation or extension is required inside the property line, the expense will be borne by the consumer.

Final connection of wiring to service will be made by this company in every case.

THREE-WIRE SYSTEM.

This system is universally employed for the distribution of current for lighting.

Installations amounting to more than the equivalent of 24 16 c. p. incandescent lamps must be wired with three-wire mains from service to distribution center, the branch circuits being equally balanced thereat.

Smaller installations will be connected to one side of the system and should be wired two-wire. Three-wire mains over 100 feet in length should be designed to deliver their full load at not over 2 per cent. loss from service to cut-out center.

Two-wire mains carrying more than six amperes a distance greater than 40 feet from the service should be of No. 12 wire.

MOTORS.

Separate lines must be run for motors and be so connected that meters may be installed to measure current used for power purposes separately.

When electric elevators are to be used in a building with other electric power, the elevator mains should be arranged for meters separate from the general power.

All motors larger than one horse-power must be designed for 220 to 230 volts, and it is preferred that motors of $\frac{3}{4}$ horse-power and larger be so wound.

ALTERNATING CURRENT SYSTEM.

Motors of one horse-power or larger must be wired for service from a separate transformer from the lighting.

The standard frequency of the alternating system is 60 cycles or 7200 alternations, and motors should be designed for this frequency.

THREE-PHASE SYSTEM.

This system being intended to supply service to motors of considerable capacity, no service will be installed for less than five horse-power. Installations of less than five horse-power will be supplied with single-phase current.

LAMPS—ARC AND INCANDESCENT.

Incandescent lamps of standard base are furnished free of charge for installations and renewal in 4, 8, 10, 16, 24, 32 and 50 candle-power sizes. No extra charge is made for lamps colored or frosted by dipping. One lamp is furnished for each socket installed in the premises at the time the installation is made. Additional lamps are furnished at any time when additional sockets have been wired and approved by the Inspection Department.

The customer gives his receipt for all lamps installed, as these lamps remain the property of the company. Lamps are renewed free of charge, when burned out or dimmed by use, upon return of the old lamps to the company's district lamp room. Clear lamps may be exchanged for dipped lamps, or lamps of one candle-power may be exchanged for those of another. As lamps supplied for installation or renewal remain the property of the company, any lamps lost or unaccounted for must be replaced at the consumer's expense.

Special lamps are charged for at the rates given herewith when furnished for installation or renewal:

Bughole.....	\$0.11
Spherical.....	.02
Genuine red.....	.14
Genuine opal.....	.14
Genuine blue.....	.09
Genuine green.....	.10
Hylo.....	.25
Genuine purple.....	.09
Ground glass.....	.02
Night lamps.....	.20
Reflector.....	.08
Miniature base, 8 c. p. ....	.05

Miniature lamps designed to operate in series are furnished only on merchandise sales.

Arc lamps having standard black finish are furnished and trimmed free of charge. Lamps having ornamental brass finish are supplied only at an extra charge. All lamps remain the property of the company.

An approved hanger board must be provided for arc lamps installed indoors. A suitable crane, provided with an insulated hook, must be provided for lamps hung outside buildings. In case lamps are to be suspended beyond the reach of a six-foot step ladder, suitable arrangements must be provided by which the lamp may be lowered for trimming.

For the Finest and Most Durable Finish



FINISH No. 1 FOR EXTERIOR WORK

FOR finishing front doors and all classes of housework exposed to the weather, where **greatest durability** is requisite. Dries free from Dust in ten to twelve hours, and hardens sufficiently in about five days to admit of being rubbed. Possesses the **maximum elasticity** attainable in any finish or varnish. Produces a beautiful lustre over natural, painted or grained woods which may be cut down with pumice stone and water to a dull finish. **Does not scratch or mar white, and resists atmospheric influences better than any other varnish or finish in use for the purpose.**

In 5 gallon cans, — — —	\$ 3 40	per gallon
In 1 " " — — —	3 50	" "
In $\frac{1}{2}$ " " — — —	1 85	each.
In $\frac{1}{4}$ " " — — —	95	" "
In $\frac{1}{8}$ " " — — —	55	" "

PACKAGES FREE.

NOT PUT UP IN BARRELS OR HALF BARRELS.

MANUFACTURED ONLY BY

STANDARD VARNISH WORKS,
CHICAGO. NEW YORK. LONDON.

SAN-ITAI-RIE CRACK FILLER

successfully fills cracks and openings in Floors and woodwork, NO MATTER HOW LARGE. Stays up level with the surface. Dries as hard as the wood itself in a few hours. MADE IN COLORS TO MATCH ALL KINDS OF WOOD. Can be sand-papered or scraped and takes the stain, paint or varnish same as wood. POSITIVELY WILL NOT SHRINK and is the best article known to put a surface on rough uneven woodwork.

WRITE FOR CIRCULARS

SAN-ITAI-RIE CRACK AND CREVICE FILLER CO.

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MANUFACTURERS OF

"TRANSPARENT WOOD FINISH."

EXTERIOR, INTERIOR, FLOOR.

For use where durability and perfection of finish is desired, revealing and preserving the beauty of natural woods.

OUR PUBLICATION, "How to Finish Natural Wood and White Enamel Work,"

FREE FOR ASKING

TELEPHONE SOUTH 26.

POINTS ON VARNISH.

BY HERMAN ROSENBERG.

Drying and Hardening.—Proper light and ventilation are absolutely necessary to facilitate drying and hardening. Varnish applied in buildings that are damp and not properly heated in cold weather, will be considerably retarded in drying and hardening. Extremely hot weather will also keep varnish soft for quite a time. The best results are obtained at a temperature of 70 to 75 degrees Fahrenheit.

Turning White.—It is caused by the action of water and dampness. The more elastic the varnish, the better it will resist this action, whereas, cheap, brittle, quick-drying varnishes are very easily affected.

Brittleness.—Is an inherent defect in the varnish caused by an excess of dryer, lack of oil, or by adulterated materials having been used in its manufacture. If a varnish powders white under friction of the finger or easily scratches white, that is incontrovertible evidence of its poor quality. Brittle varnishes should not be used even for the undercoats, as they destroy the toughness and durability of the finish, despite its being protected with an elastic, durable finishing varnish. It is poor economy, in any event, to use brittle varnishes, as the cost of application, which is the main expense, is the same as if good material were employed.

Chilling.—As its name implies, is caused by exposure to cold weather. Varnish should never be used while in this condition. To remedy is to keep the chilled varnish in a warm room, until it has been restored to its normal condition. Long exposure to cold weather may also cause the varnish to become "specky" and "seedy," in which event it is necessary to keep it near a steam pipe or warm stove for some time, until the chilled particles have disappeared.

Cracking.—Cracking is caused by the under coats not having been dry when the finishing coat was applied, or when abnormally heavy coats have been used, especially for the undercoats. Brittle varnishes are liable to crack when exposed to sudden changes of temperature.

Blooming or Going Foggy.—Is caused by exposure to dampness, moisture or gases, after the varnish has become hard. The more elastic the varnish, the less liable it is to "bloom" or become "foggy."

Wrinkling, Crawling, Cramping or Sagging.—Is caused by applying the varnish too heavily or by exposure to sudden changes of temperature while in the process of drying, or if the undercoats are not dry when the finishing coat is applied.

Deadening or Sinking Away.—Caused by the undercoats not having been allowed sufficient time to dry, causing the finishing coat to become absorbed while in the course of hardening. Insufficient foundation coats will also cause the finishing to sink away.

Blistering.—Is caused by the action of heat, especially from the concentrated rays of the sun, if sap or dampness is retained in the wood, or if moisture exists in the undercoats when the finishing coat is applied.

Pitting.—Is caused by applying varnish over an oily or damp surface; also, if the varnisher is not careful to thoroughly incorporate the turpentine in reducing the varnish, or uses improper thinning material.

Knots and Sappy Woods.—The sap and knots should be "killed" by the use of grain or wood alcohol shellac for the first coat. If this is not done, the sap will work through and injure the finish.

Thinning.—When found necessary, should be done with spirits of turpentine. In order to insure proper amalgamation, neither the varnish nor the turpentine should be too cold when mixing. The warmer the varnish and turpentine, the quicker the amalgamation. After reducing the varnish, allow it to stand awhile before using. Oil, Japan or liquid dryer should **never** be added to varnish.

SWEATING.—Is caused by rubbing the undercoat before it is thoroughly dry.

New First National Bank Building OF CHICAGO

D. H. BURNHAM & CO., *Architects*



FINISHED
WITH   **NISORON VARNISH**

Selected Because of Its Superior Quality

The PATTERSON-SARGENT CO.
MANUFACTURERS

CLEVELAND

CHICAGO

NEW YORK

VARNISHES.

Not many years ago England held the supremacy among the old world countries as a producer of high class varnishes; to-day the American manufacturers enjoy a large export trade and are represented in the important cities on the other side of the Atlantic. This change has been brought about by the determination and ability of the American people to keep abreast with everything in the line of progress. It is not that there is any great difficulty in producing good varnish, but the inquiring turn of mind of the people who have grown up with the country, coupled with their inceptive faculties, has brought them to the front in this as in other manufactures.

In the making of varnishes, the blending, cooking, settling and maturing are of great importance.

There is much in the choice and mixing of the materials, and the makers distributed throughout the states seem to have mastered the problem. China and Japan have a natural varnish derived from the sap of various trees, and lacquers are produced which cannot be excelled, and are comparatively indestructible; the beautiful lacquer ware of the East is the result of this product.

Africa, Zanzibar and islands around furnish gums of a hard and pale character from which the highest classes of exterior and coach varnishes are made. The kinds of extinct insects found embedded in the raw materials attest the length of time since the gums exuded from the trees, and show that ages have elapsed since the deposits began.

In making varnish, it is of paramount importance that care be taken in melting the gum, and the linseed oil must be of the best quality, and well settled, the boiling of the oil requires expert knowledge, and the mixing, cooking, cooling and thinning with turpentine call for practical experience; then come the clearing and filtering, which are not by any means unimportant factors.

The proportion of gum to linseed oil in high class products is 8 lb. gum to 3 gal. of oil.

The less expensive grades are not given the same care as those alluded to above, and gums which are capable of more easy combination are used, such as Kauri or Manila.

Manufacturers employ their own manner of mixing.

There are so many makers of good varnish in Chicago that it would be invidious to particularize, and the chances are that if they severally knew the end desired by the purchaser, both as to use and price, they would come out very much alike in results.

The temperature when varnish is used is an important factor. It cannot be expected that good results will be achieved if the atmosphere is moist or freezing. It should also be remembered that a varnish for interior work will not stand the weather, and again there are matters connected with its application or laying on which are not understood by a tyro. Much skill is required.

It will be to the advantage of the purchaser to deal with those who have a reputation to maintain, the labor of applying the material is about three-quarters of the expense, and costs just as much whether good or poor material is used.

The enamel finish, which is now so much in vogue, is simply made by the use of a good varnish combined with pigments that have a natural affinity for the gums. This combination, when ground through water cooled mills, makes a paste or liquid (as desired) that can be applied over a painted surface, producing a finish that will wear for years. This is the most expensive method of painting or finishing known to the trade, and requires the most skillful treatment on the part of the painter. The "rubbing down" of the surface, in order to make the egg shell effect, must be the work of an expert. A cheap enamel is the worst material that can be applied to woodwork. It either cracks or becomes tacky when moist atmosphere prevails, and is a source of great annoyance.

Gums and related articles which are used for preparing varnishes are derived from the vegetable kingdom. They have a very peculiar growth which may be likened to a disease that has its seat between the bark and wood of a tree. Gums have been used since the very dawn of civilization, and in ancient Egypt they especially found a place in religious ceremonials, and to-day their fragrant fumes are wafted in the churches.

The painter uses them in the shape of varnishes and shellac, the confectioner puts them in his sweets, and the druggist sells them in the shape of "asafoetida," "slippery elm," "copaiva" and in many other forms.

A precious relic of the number of gums which were produced in the by-gone ages was found by the Phenicians some 3,000 years ago on the shores of the Baltic—the Greeks called it "electron," from which word we derive the term "electricity." In English it is called "amber," and in German "Bernstein." It has a place among the precious stones.

Gums may exude through natural splits in the bark of trees, or incisions may be made artificially, and in some cases these incisions are the only means of obtaining a supply. The exuding liquid, sticky at the start, solidifies in contact with the atmosphere, and is formed into irregular lumps varying from small to a very large size. The trees most prolific in producing gums are certain "pines" and "acacias." A silvery looking gum is derived from a "mahogany."

Gums are originally found mixed with wood-fiber, grains of dust, and with innumerable insects, the mass often accumulating to such an extent that it falls off, hence the finding of immense quantities below the surface of the ground in new sites or new countries, which are gathered from the deposits of yesterday or the accumulations of thousands of years. It is said that in New Zealand alone more than 4,000 people are engaged exclusively in digging up and gathering gums for making varnishes. The commonest kinds of gums are the "resins." Shellac is but a certain kind of refined "resin" in a form of flakes.

Rare gums of limited bulk found on the branches of certain trees are the result of stings into the bark from insects belonging to the bee tribe. Writing ink in bygone times was procured from the lumps on oak leaves which had been caused by the poisonous sting of the gall-wasp. These lumps were boiled and produced the liquid.

Related to the gums are gutta-percha and India rubber, and further related are the "tars."

Many of the gums are soluble in water, others in alcohol, etheric oils, turpentine, earth oils, etc. Oil obtained from linseed is especially essential for the production of varnishes.



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OFFICE HOURS AND HOLIDAYS.

Paper read by Normand S. Patton before the Chicago Architects' Business Association, June 23, 1903.

The employees of our office petitioned recently for an extension of the Saturday half-holiday, which we have been giving during the summer season, to continue the whole of the year, and, upon making inquiries from a number of architects as to their custom and finding it is quite general to give the half-holiday for the whole year, we granted the request of our employees, and anticipate that this additional leisure time will be as much appreciated by the members of the firm as by our assistants. It then occurred to me that it might be of interest to this association to know what is the general custom in regard to office hours, holidays and vacations, and therefore sent inquiries to a number of architects and have replies from 19 offices, which are sufficiently representative of the profession to indicate the general custom.

Three offices have a 7-hour day, and six have 7½-hours and eleven have 8 hours. More than one-half therefore having 8 hours as their working time.

Two offices begin work at 8 o'clock; one office at 8:15; twelve offices at 8:30 and three offices at 9.

One office has no set time for beginning work; the employees being expected to work 8 hours, and those who come early leave early and those who come late stay until their 8 hours is completed; the architect claiming a certain convenience in this for a small office, though of course it would be destructive to discipline in a large office. The hours for closing are divided about equally between 5 o'clock and half past 5. There is an allowance of one hour for lunch in nearly every case.

In regard to Saturday half holidays, six offices give such holidays during the summer months; twelve offices during the whole year and one office closes at 3 on Saturday, as I understand, for the whole year.

In regard to vacations, the custom seems to be universal to allow two weeks vacation with pay to all employees who have been in the office a year or more, but not to those who have worked for a shorter time. It would seem that there ought to be a general uniformity of practice in all architects' offices in one city, in regard to the matter of office hours and holidays and vacations. Apparently in Chicago the two weeks' vacation to permanent employees is generally recognized, and the Saturday half holiday, which has been coming to be recognized more and more in the community, will doubtless be extended to take in the whole year by all architects, when they learn that the majority of offices are already granting that privilege.

In the matter of office hours, the preponderance is decidedly on the side of an 8-hour day, although there are enough offices that work for a shorter time to present a decided lack of uniformity. This is a matter which might be well discussed by this association and perhaps a uniformity could be brought about.

There are other matters of business management of our offices which could be taken up with advantage, as, for example, the question of over-time, as to the policy of working evenings and whether there should be extra pay for such over-time. My own opinion on this point is that over-time should be avoided wherever possible, and that in most instances this can be done by the exercise of foresight. To work evenings for any length of time will certainly exhaust the energies and render the day work less efficient, so that the gain is comparatively small and not in proportion to the additional effort, and that better results can be secured by urging everyone to extra exertion during the regular office hours at the time when there is a rush of business and supplementing by additional help; and that in the case of permanent employees there should not be extra pay for over-time. If everyone knows that in case the work is allowed to drag along and is not done on time and they must stay and work at night, it will be a stimulus to each one to finish his work during the day and thus avoid the need of overtime; and when such an effort is insufficient then the working force should be increased during the day, rather than to overwork by the addition of extra hours.

The following was ordered published as the result of Mr. Patton's paper:

The question of office hours, holidays, and vacations in architects' offices has been a subject of discussion and inquiry by a committee from the Chicago Architects' Business Association, and it finds that the consensus of opinion of the majority of the architects of Chicago favors the following rules: 1. Working days to consist of eight hours, except Saturdays. 2. Offices close on Saturdays at 1 p. m. during the entire year. 3. The observance of six legal holidays, namely, New Year's day, February 22, May 30, July 4, Thanksgiving and Christmas. 4. The allowance to all permanent employees who have done service for one year or more, of two weeks' holiday each year without deduction of salary.

A resolution as recommending the above was introduced and carried by the association.

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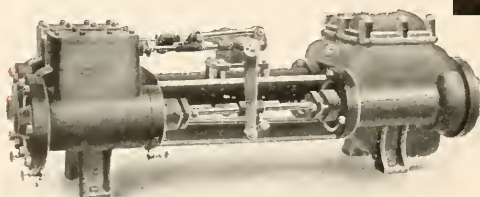
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The demand for machinery for handling all sorts of materials in loose bulk, or in packages, has brought out an endless number of methods for doing the work.

For small quantities of material the cheapness of cars, trucks, and platform elevators, render this equipment desirable; but where large amounts of material are handled, a further saving can be made by the use of over-head trolley-ways or cable-ways, which may be further developed by having self-propelling carriers, or chains, to drive them. Machinery for the continuous methods may be divided into two classes; those making use of rubber belts, and those using chain. The great advantage of the belt conveyor is, that it is absolutely silent and takes up little room.

For handling materials gritty in their nature, which do not contain lumps or pieces of considerable weight, which are to be discharged at one point, or discharged through a tripping device (such as is used in grain elevators) there is probably no method to equal the belt. It, however, cannot be run up any steep inclination without "buckets," which materially cut down the "life" of the belt.

In equipping a belt conveyor, the type and spacing of the carrying idlers is of importance. The spacing will vary with the weight of the material, and as each idler requires a certain amount of power and wears the belt, they should not be placed too close together. Ordinarily, for materials like coal, the spacing is about four feet; but under certain conditions the rollers should be placed closer. The return idlers should not be closer than fifteen or twenty feet.

In conveyors handling materials like grain, it is possible to space the carrying idlers much further apart, and it may be desirable to run the belt flat.

The character of the troughing idler is another important matter. The angle of the sides of the belt should not be too great, not exceeding thirty degrees. The center of the belt should be supported where the belt leaves the inclined troughing pulley.

The point of greatest importance is the belt, and the price is a fair index to its quality. A conveyor belt should be very soft, and unless of great length or very wide, should not be more than four or five plies thick, so that the troughing idlers may shape it without excessive pressure.

If material such as grain or sand is to be carried, a special rubber cushion on the carrying surface is unnecessary; but in carrying abrasive material, such as ore or coal, this becomes of great importance. The value of this carrying cushion depends upon its softness and toughness, and its ability to resist cutting. A fair way to test the cushion material is to bite a small portion off with the teeth.

Where material of large size is carried, or where the inclination is sharp, or vertical, or with automatic transfers from the horizontal to the vertical, the belt conveyor is not so well adapted as some of the types of chain conveyors.

The slower the mechanism moves and the heavier the parts are the better the conveyor will last. The chains themselves should have large wearing surfaces, and the pins on which the chains turn should have a long seat in the mating link. For gritty material a case-hardened steel bushing is of great value.

Riveted chains are superior to, and stronger than, chains with the links bolted together. As repairs will always be a serious question, the architect should consider whether an ordinary blacksmith can make any repair parts. This cannot be done with malleable iron chains. The ordinary round link chain is also objectionable, on account of the rapid wear due to the small contact between the links.

Conveying machinery engineering is a specialty. All hard and fast specifications should be avoided, except as regards capacity and the general character. But the architect should consider first whether a sufficient difference exists between theoretical or actual capacity required; where chains are used, the wearing parts, such as pins and mating journal should be protected by case-hardened "thimbles" or "bushings," and suitable provision made for proper lubrication.

All rollers should have a diameter relatively large in comparison with the pins. If the roller carries much load the face should be chilled. If rollers are made "self-oiling," this feature should be such as will not fail to operate after being used a reasonable length of time. Most self-oiling devices make use of some fibrous material to hold the oil in the wheel; but if this material rotates with the wheel or rubs on the pin it will become clogged. Ordinarily, chain lubrication is impossible and should not be depended upon. But where gritty material is carried the lubrication of rollers, etc., should be made, preferably, by a hard grease under pressure, or by oil enclosed and entering the journal near the center.

Strength being apparently equal, lightness is a valuable feature; hence forgings and steel stampings are preferable to castings or malleable iron construction.

In regard to patented devices, it may be said that there is not now any detail or type of construction on the market which is not made by several competing manufacturers without infringement; and competition may be found for furnishing all devices of any real merit.

THE MODERN STORE-FRONT.

A Paper read before the Chicago Architects' Business Association, Feb. 16, 1904.

In Sturgis' Dictionary of Architecture "Shop-Front" is defined as "that portion of the front of a building which is especially arranged to afford extensive show windows for a shop or store; characteristically, it is a screen of windows, glazed with large sheets of plate glass, the door being in a recessed vestibule and the structural supports being reduced to a minimum so as to give the greatest possible space for display of goods." This is a good definition of the modern shop-front though fronts for shops have been built for many centuries—long before the advent of plate glass.

I have in mind a shop front in a two-story stone structure at Cluny, France, built in the 12th century, the shop front being confined within a pointed arch, which, with its abutments and a small square headed door on one side occupied the first story.

Many shop fronts, built in the days of half timber houses are still in existence, even in use, in towns in Normandy, and Liseaux, Bayeux and Vitre boast many charming examples. In Bavaria, Germany, Rothenberg on the Tauber and Chester in England have creditable work in store fronts from about the same period.

In fact these early fronts possess a picturesqueness entirely lacking in our modern work, and this is not surprising. All apparent supports were not eliminated. Glass could not be made in sizes we use to-day for this purpose.

Not until polished plate glass was introduced do we see important structural supports suppressed behind the window, and not until the introduction of the steel girder do we see these supports eliminated.

In the evolution of the store front picturesqueness has given way to glass surface until to-day we may have two or three feet above the glass and perhaps the same space at the two extreme ends (more often not that much), of the facade to frame in our front. All other members must be slender bars, just enough to hold the glass. The shop-keeper cares very little about the frame; it's the picture within the frame, the display in the window, set up to attract the public to his goods for sale within, that interests him.

These are the conditions the architect of a store building is given and these he must recognize. He will find himself, perhaps, setting his 10 or 12 stories above the store afloat upon a sea of glass.

Many fronts there are that afford a good opportunity for display of goods, but not so many where an adequate architectural frame is introduced; and how few, how very few where the store front can be at all reconciled to the rest of the facade.

This is, I believe, one of the most difficult problems the architectural designer of commercial buildings in America has to solve.

In Europe the problem is varied by the introduction of two expedients which, as far as I know, have not been tried on the same scale in this country. We all know the Rue de Rivoli, Paris, skirting the Tuileries Gardens. You will remember that for a distance of about half a mile the sidewalk on the north side of the street is within the building line and pedestrians are constantly under cover except at street crossings, the second story extending to the street line, where the street curb is also placed. This half mile is a continuous line of shops, and successful shops.

We have in this country examples of shop fronts recessed from the building line with a promenade within the piers of the front along the show windows; but invariably the sidewalk extends along the outside of these premises. This is, I maintain, a disadvantage to the shop-keeper. Pedestrians in fine weather are apt to walk in the sun and thus neglect the display windows.

This recession of the sidewalk is, of course, not generally to be recommended, but there are cases of congested streets—where this arrangement would be a great relief. At the same time it would give an opportunity to the architect to carry his principal vertical supports down to the ground in a way that would be more consistent with the principles of architectural design.

That this matter is receiving more or less attention at the present day is shown by a recent article in a New York architectural journal, wherein the writer urged the widening of 52d street in this manner to relieve the congestion of that street.

The store front certainly need not suffer by this arrangement, since the architect will have greater freedom in designing his shop front, there being no superimposed facade over the store front.

What would you think of Wabash avenue within the loop with its sidewalks within the building line, its store fronts 16 to 20 feet back? Would you not feel safer crossing the street or taking a surface car if the crowd of teams on either side of the elevated structure had 20 feet more space to distribute themselves over?

The matter of remuneration to property owners for space sacrificed to the public is a point we need not discuss here.

In the February number of the Architectural Record, Mr. Frank Howe, in an article

on Kansas City Architecture, in speaking of the largest and most important mercantile structures in that city has this to say, referring to the Emery, Bird Thayer Dry Goods Co.: "A novel feature of this building is its open arcade on the three streets, with the show windows set back some six or eight feet from the building line, making a covered promenade, where, in bad weather, passers may examine the displays while well sheltered. So far as I know this is the only example of its kind in this country and while there is apparently a waste of room, the owners consider the advertisement an ample compensation."

And if you will turn back the pages of history you will find "that in the fourth century it was feasible to go afoot from almost any point in the central regions of Rome, north, south, east or west, for a mile or two, while keeping always under cover; except indeed as one crossed a street or avenue, though even at such crossings there was often the Tetrapiylon the four fronted gate-way, to carry the shelter on from portico to portico."

Let us now turn to the second expedient which has been tried in this country only in a small way; with what success I do not know.

I refer to buildings like the Gallerie Vittorio Emanuele at Milan, and the Galleria Umberto, Naples, both modern commercial buildings.

Each occupies a square bounded by streets. Bisecting each front are avenues or promenades that form a cross in plan, spreading to an octagon at the intersection. These interior arteries are roofed with barrel vaulted glass ceilings intersecting with the glass enclosed dome at the intersection of these avenues.

In both cases the first story is devoted to shops and cafes fronting on the streets and on the interior promenades. Both are four high stories above the street, a height we would ordinarily allow for five or even six stories.

In the Milan building the promenades are 960 feet long, 48 feet wide and 94 feet high from pavement to glass roof. The top of the octagonal cupola is 180 feet above the pavement. Needless to say the light and air are ample and these promenades, with their attractive shop windows, form one of the principal sights of Milan. This building was begun in 1865 and completed in 1867.

The Galleria Umberto is a more recent structure.

To come now to conditions immediately surrounding us in Chicago. Every retail store-keeper in the down town district for the past few years has been lying awake nights thinking how he might secure more conspicuous show windows than his competitors. His architect has planned for him fronts that project so far onto the sidewalk, that they are commonly called bays. The City authorities have been accommodating in this matter. They are less accommodating in giving away sidewalk space now. The Supreme Court of the State of Illinois has held in a number of cases, that a municipality has no right to lease or allow to be occupied, any space in any thoroughfare by any structure or projection that will prevent a person on said thoroughfare from being watered by the rain falling from the heavens.

This decision, strictly interpreted would compel all cornices, entrance features, sills, cap and base projections to be planed off the fronts of existing buildings, leaving them with as much architectural interest as an asphalt pavement. New buildings would be no better off.

The new Marshall Field retail store does not encroach, in fact, the show windows are some 8 or 12 inches back from the street, which is not to their detriment.

The size of these plate windows is 144 by 216 inches, the largest plates in superficial area in Chicago and as far as I have been able to find out the largest in America.

The new Schlesinger & Mayer front, to my mind a more typically American store front in that the first story at least is entirely of metal and glass, has plates of greater width though of less height than the Field front.

It may be of interest here to inquire what is the largest sheet of polished plate glass obtainable. To this question glass dealers reply, that no limit has been set by the factories, but by the height of the railroad bridges.

A mirror in the Paris Opera House is said to be the largest plate ever made and set. This is Belgian glass, 23 by 31 feet.

There are in this country 18 factories making plate glass with two more now building. And at that, perhaps from 15 to 20 per cent of the plates used in the United States are imported from Belgium, on which a duty of 35 cents per square foot is paid Uncle Sam.

Before closing I wish to say a few words about the progress made in the manufacture of ornamental iron and bronze for store front purposes.

On these materials the architect must principally depend to make his front something more than a mere piece of polished glass.

The manufacturers have been quick to catch the designers' intention, and have spared no time nor trouble in modeling or pattern making, so that to-day I believe there is no doubt that America is second to none in the excellence of ornamental cast metal work.

ARTHUR WOLTERS DORF.

ASBESTOS.

Paper read before the Chicago Architects' Business Association, by
Mr. T. G. Younglove, January 19, 1904.

It is not altogether easy to give an intelligent answer to the question often asked "What is Asbestos?" Geologists classify it among the hornblendes; dictionaries tell us that it consists chiefly of silica, actinolite, magnesia, lime and oxide of iron. In itself asbestos is a physical paradox, a mineralogical vegetable, both fibrous and crystalline, elastic, yet brittle, a floating stone, but as capable of being carded, spun or woven as flax, cotton or silk. It is apparently the connecting link between the vegetable and mineral kingdom, possessing some of the characteristics of both. In appearance it is light and buoyant, yet in its crude state it is dense and heavy as the solid rock in which it is found. The action of unnumbered centuries, by which the hardest rocks are worn away, has left no perceptible imprint on the asbestos found embedded in them.

It is vaguely understood that the principal claim of asbestos to attention is that it cannot be consumed by fire, and while there are many who have a general knowledge of this remarkable product, others, who profess to be informed, in reality know little of its value and adaptability to the requirements of the present. We read that asbestos was used by the ancients, to enwrap dead bodies placed on the funeral pyre, so as to preserve the ashes of the dead; that the Egyptians wrapped their dead in cere-cloth, woven from the fibre, in order to preserve them, but the real interest in asbestos centers in the present, as it is of more importance to the human race today than ever in the past and is indispensable to many of the arts.

Asbestos has been found in all quarters of the globe, but the only varieties demanding serious consideration, from a commercial point of view, are the Russian, the South African, the Italian and the Canadian. Blue asbestos is found in South Africa, the color being caused by large proportions of oxide of iron which gives the fibre exceptional tensile strength but detracts from its fire-proofness. It contains little lime or magnesia and consequently, when exposed to fire, it weakens and crumbles. Before the development of the Canadian fields, the Italian asbestos was supreme in the market, grading from Floss asbestos fibre to the fine white powder used in paints and for similar purposes. The fibre contains a large percentage of magnesia, but is not of a uniform grade and it cannot be spun into threads or yarn for cloth or rope like the Canadian asbestos.

Asbestos is found in many localities of the United States, but it is, as a rule, very brittle and valueless.

Canada contains the great asbestos region of the world in the sense that, while its mines are practically unlimited in productive capacity, the product is of a quality which fully meets the requirements of the many uses that are being daily found for it. Nearly the entire yield of the Canadian mines is consumed in America. The rock carrying marketable asbestos is generally a serpentine of some shade of green in which are contained small particles of iron.

The method employed in mining is by drilling and blasting. Large pits are dug in the rock to any depth desired and widened to suit the requirements of location or the deposits of asbestos.

Both rock and asbestos removed from the pits are conveyed to a mill where they are crushed by powerful rollers and pass on to a series of screens which separate the asbestos from the rock, according to the length and grades of fibre, the latter being removed from the screens by air suction, created by a system of fans, one for each grade of fibre, the latter being delivered in large hoppers from which it passes through spouts, into bags or barrels, and made ready for shipment. The greatest portion of the remaining rock is conveyed to a dump, and constitutes from 75 per cent to 90 per cent. From this finely crushed serpentine rock, is derived, "Asbestic" wall plaster.

Asbestic is absolutely unaffected by heat or moisture, will not crack or crumble when properly applied—is a non-conductor of cold, heat and sound. Asbestic has been used in many prominent buildings here, and particularly in England, Germany and Sweden, it being used for out door work as well as inside plastering. It is used as a surface coating for asbestos roofings and reduces the heat on upper floors during the summer season and makes the roofs fire-proof from burning embers and sparks.

With the exception of the large quantity of asbestos fibre which is used for different purposes, such as filtering, and to give strength and durability to materials, other than those made entirely of asbestos, the product of the mines is shipped to this or foreign countries, to be made into fabrics, papers, boards and innumerable fire-proof and insulating specialties.

To the electrical engineer and in the construction of electrical devices, asbestos

is indispensable. In the electrothermic apparatus and in the electric heater, the heating effect of the current is utilized by embedding or wrapping the wires in asbestos. By the mixture of asbestos and rubber vulcanized, is produced one of the most efficient and most durable electrical insulations for special requirements called "Vulcabeston," which may be moulded in any form desired; also in sheets.

Asbestos roofing is made of asbestos felts which are saturated and cemented together with an asphalt composition. Some grades of roofing are made with a foundation of burlap, which adds to the tensile strength. These roofings will not decay as they contain no animal or vegetable fibres. They are unaffected by gas or acid fumes. They are classed as non-combustible.

The use of asbestos felts of different thicknesses is well known. As a fire-proof retardant and as an insulation. Other special asbestos felts of laminated construction are superior for deadening purposes.

Asbestos board is used for fire-proofing walls, ceilings, etc. Transite board made under compression, has many advantages over the ordinary asbestos board, especially when subjected to great vibration or rough handling. Manderite, made similar to transite, may be painted, grained and finished to represent the most expensive wood-work.

Pipe and boiler coverings are made entirely, or in part of asbestos, their durability and heat resisting value being proportional to the amount of asbestos contained in them. Other forms of covering are magnesia, containing about 10 per cent of asbestos fibre—combination coverings of wool felt, hair felt and mineral wool, all of which have one or more layers of asbestos felt next the iron; and asbestos moulded made of plaster and asbestos fibre.

Cements for heat insulation and fire-proof cements for retort and furnace work, are largely composed of asbestos.

The list of additional manufactures includes packings, joint runners, filtering cloths and flms, gloves and mittens, stove linings, jewelers' blocks, dental blocks, asbestos ropes, table covers and a large number of household articles.

The recent calamity which caused so much sorrow to our citizens, has resulted in an unjust criticism of asbestos material. By this, I mean, pure asbestos. This is unfortunately an age of adulteration, not only in the line of building materials, but in many other directions, including the foods we eat. In the construction of buildings, it is largely due to a sacrifice of safety and comfort, for outward appearances. Asbestos cloths for filtering and many other purposes are made with from 5 per cent to 10 per cent of cotton, and are known as "commercially pure." The company which I represent make their own cloth for curtain work, of pure asbestos fibre, either with or without wire. A curtain must be properly hung with steel cables or asbestos rope running through iron pulley blocks, to insure accuracy of operation under all conditions. There should be an iron pipe inserted in the pockets at the top and bottom of the curtain, not wood rollers, or battens.

Pure asbestos cloth has been tested at Armour Institute and found to have a tensile strength of 120 pounds per inch, which, however, cannot be said to represent the maximum strength of the cloth when made in a curtain, as additional strength is then secured by selvage edges, and double sewing at the seams. Other tests were made by saturating the cloth with gasoline, which, when ignited, burned 15 minutes. The same piece of cloth was then subjected to the flame from a gasoline torch for fifteen minutes longer without affecting the strength of the materials. Another test with a torch continued for 45 minutes, at a temperature of 1,800 degrees F. without injury to the cloth.

A test of a piece of asbesto-metallic cloth in which the warp and woof are composed of brass wires wrapped with pure asbestos fibre, showed a tensile strength of 110 pounds per lineal inch.

It is assumed that under the most unfavorable conditions of ventilation over the stage, the wind pressure against a theatre curtain will not exceed 15 pounds per square foot, therefore a curtain made of pure cloth or asbestos metallic cloth, the same as tested, would withstand any strain to which it might be subjected.

Until pure asbestos cloth curtains are shown to have failed to perform their function, they should not be condemned.

The objectionable features which suggest themselves in the construction and operation of metal curtains are as follows:

That their great weight requires their operation by mechanical or electrical methods, either of which adds to the danger of failure to operate, at a critical time, the controller, of necessity, being at a single point, which might be that first attacked by fire, it being established that steel will expand one inch in 100 feet for every 150 degrees of heat.

That, unless fire-proofed in proper manner with pure asbestos or combined asbestos and magnesia materials, steel or iron curtains are least safe of any, as has been substantially admitted by the framers of the proposed new ordinance, which requires that the stage side of the steel curtains shall be fire-proofed.

"MAGNESITE PROCESS OF INTERIOR FIREPROOF AND SANITARY CONSTRUCTION."

Paper read before the Chicago Architects' Business Association, May 10, 1904,
by Mr. Edwin D. Weary.

Mr. Chairman and Gentlemen:

It may be well to preface my remarks with a word of explanation, if not of apology, and I wish to explain that I was invited, some time since, by Mr. Wheelock, to come here and talk to you about tiles.

Now I regard tiles as a good thing, being in the business, and I am quite fond of talking about them, but I explained to Mr. Wheelock that I had recently taken up a fire-proof and sanitary proposition, a European process, which I thought would be of far more interest to you.

I shall first try to explain in a brief way the process, and purpose of this material, after which I shall be pleased to exhibit these specimens and shall try to answer any questions you may propound.

The subject of fire-proof construction is one that at the present time is attracting the widest interest. There has been within the past few years, much advancement in this line, that is in constructional work proper, but as yet there has been very little betterment in the interior finishing, or decorative parts, that is, there has not heretofore been discovered, or developed, any material that will take the place of wood for the many uses of interior finishing.

It is true that the wise Aldermen of New York have legislated, to the delight of certain producers, that all wood work which enters into interior construction on Manhattan Island shall be "fire proofed," that is, treated with a dope which destroys the native beauty of the wood, makes it extremely difficult to work, and which has a fire proof quality of very doubtful value, and which quality I am told departs within a very short time after application. But this process has not met the want, and does not, I am informed, meet with the approval of the better class of Architects.

The recent fierce conflagrations have demonstrated beyond all doubt that the modern fire-proof building will not do; and that some method of fire-proof construction for interior finishing must be devised.

I have talked recently with a gentleman who went to Baltimore to make some personal investigation, and I have read with interest the pamphlet on this subject printed by the Roebling Construction Co., and I quote, under their topic of "Buildings of the Fire-proof Class," as follows:

"An interesting phenomenon that was generally noted was the complete combustion of everything inflammable in these buildings. The wood floor sleepers which had been imbedded in concrete were entirely consumed, leaving the empty furrows in the concrete without a particle of charred wood. Even the soot and smell of smoke were absent. The high wind undoubtedly fanned the flames, and generated temperatures as high as 1,900 to 2,100 degrees F.

"This was indicated by the fusing of metals. On account of the small amount of the fuel, which was generally limited to the wood floor finish, wood trim, furniture and furnishings, this temperature was probably not maintained for more than an average of 20 to 30 minutes at any given place. In other words the fire was intense while it lasted, the wind keeping the embers alive until every vestige of wood work was consumed."

In view of what has happened in these recent fires I therefore feel warranted in asserting that there is in the best type of modern fire-proof building enough wood work to consume, or destroy it, and I predict that within two years there will not be, in the new fire-proof building, enough wood to make a lead pencil, and these I believe are only logical conclusions which are forced upon us by the recent disastrous fires.

The material which we have to present is Arilite, or Petramite, and we call it the "Magnesite" process. Magnesite is a well known material, of a high class, and has been heretofore imported from Austro-Hungary and Greece, but the American Magnesite Company have opened up some very extensive mines in the red mountains in California, and have, I am told, some twenty-five million tons in sight of a superior grade.

Magnesite proper is not essentially a cement, and we use it principally for its high fire-proof quality and in combination with certain chemicals, so that when the chemical change takes place the magnesite has disappeared, or is transformed, and an analysis discloses no trace of it. It is not my purpose to discuss the chemical side of this proposition, there is very little known in chemistry about the action of cements, and I do not understand that any chemist is able to tell precisely what chemical action takes place in its set. We do know that there is evaporation and a considerable contraction, and that it does not get its full set for some months, and that the setting develops a tremendous internal strain, so that as the tension increases the mass is almost sure to part at the weakest point. We see numerous instances of this in mosaic and other similar pavements, and we know also that conditions of temperature and humidity cause a continual expansion and contraction.

The material we present to you, however, is a different chemical proposition altogether, and in explaining about it I much fear I shall have to talk some shop. It contains no water, and there is no evaporation. A pound of arilite in a plastic state, will weigh, when set, precisely a pound, not a fraction of an ounce more or less.

The chemical change is a crystallization, or more properly a petrification, and the transformation is complete in less than forty-eight hours, and there is no internal strain, so far as we can discover.

We claim for arilite the following properties:

It is absolutely fire-proof, and a perfect non-conductor of heat and electricity.

It has no expansion or contraction.

It has remarkable adhesive qualities, and will unite with wood, marble, cement, granite, vitreous tile, glass or metal, and the adhesion can only be prevented by treating the object with certain oils.

It can be made in any color, or in any texture, as soft as wood or as hard as flint, and in the softer textures can be nailed or sawed.

Its specific gravity is very high, about half that of Portland cement, it has a great tensile strength, and for this reason can be used in much less bulk.

It can be made of the tensile strength of steel, by casting it in a vacuum, it being simply a problem of extracting the air so that the molecules will be in absolute contact.

In casting, the material will take the precise configuration of the object of contact. For example, if cast on glass, or polished brass it takes on a high transparent glaze, which is a natural glaze, being the precipitation of the solution, and which is very hard and durable, while if in contact with wood it will take an absolute imprint of the grain, and color, and will take up as well any vegetable or aniline color with which it is in contact.

No firing or heat is used in its construction.

Its uses are almost innumerable, and I refer to them briefly. Pavements of all classes, for interior and exterior use. It may be spread one-half inch thick over wood or concrete, by troweling, and of the hardness of wood, or of granite, or can be intermixed with marble chips, shells or gravel, and rolled to place as is terrazzo. In this class of pavements we use an electric surfacer, with which we are now surfacing the marble pavements of the First National Bank, and which produces a true and perfect surface.

In tile pavements we produce the marblithic or granito type, in hexagons or squares, also a class of tiles similar to the encaustic type, and on these we also use the electric surfacing machine.

Wall tiles, both glazed and unglazed, and made also with marble chips or shells intermixed. Wainscot slabs of all classes, sanitary bases, stairways, window and door casings, both glazed and in imitation of wood, window sills, lintels, thresholds, wire moldings, pipe coverings, and as a grouting for Belgium block pavements in the streets.

Arilite is invaluable as a cement for setting tiles. In the old process, using Portland cement, the tiles must first be immersed in water, which in the case of glazed tile is the primary cause of the crazing, while with arilite they are set dry, and the adhesion is perfect.

I will show you examples of all of these things, and very many more interesting specimens. I have with me a piece which will cut glass, a piece on which I melted, with a blow pipe, a copper cent holding the piece with my fingers one inch away from the flame, a piece of tile which was firmly attached to a white washed post, cubes with marble chips introduced and which have an arris as sharp as can be made in wood, and numerous other interesting experimental pieces. I shall take pleasure in mailing to you a record of the tests which are now being made in the laboratories of the North Western University, and shall be pleased to have you visit the works of the Plastic Construction Company.

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Five (5) Ply Wool Felt, Composition and Gravel Roof.

First cover the sheathing boards with one (1) layer of dry felt and over this put four (4) thicknesses of wool roofing felt, weighing not less than fifteen (15) pounds (single thickness) to the square of one hundred (100) feet. This felt to be smoothly and evenly laid and well cemented together the full width of the lap, not less than nine (9) inches between each layer, with best roofing cement, using not less than one hundred (100) pounds of roofing cement to the square of one hundred (100) feet. All joinings along walls and around openings to be carefully made. The roof to be then covered with a heavy coating of roofing cement and screened gravel, not less than one (1) cubic yard of gravel to six hundred (600) square feet, gravel to be screened through $\frac{5}{8}$ -inch mesh and free from sand and loam. All walls and openings to be flashed. If not, the rear end of the walls to be flashed not less than fifteen (15) feet from the gutter on each side.

Six (6) Ply Cap Sheet Wool Felt, Composition and Gravel Roof.

First cover the sheathing boards with one (1) layer of dry felt and over this put four (4) thicknesses of wool roofing felt, weighing not less than fifteen (15) pounds (single thickness) to the square of one hundred (100) feet. This felt to be smoothly and evenly laid and well cemented together the full width of the lap, not less than nine (9) inches between each layer, with best roofing cement, using not less than one hundred and twenty (120) pounds of roofing cement to the square of one hundred (100) feet. The entire surface then to be mopped over with roofing cement and a cap sheet of wool felt applied. All joinings along the walls and around the openings to be carefully made. The roof to be then covered with a heavy coating of roofing cement and screened gravel, not less than one (1) cubic yard of gravel to six hundred (600) square feet, gravel to be screened through $\frac{5}{8}$ -inch mesh and free from sand and loam. All walls and openings to be flashed. If not, the rear end of the walls to be flashed not less than fifteen (15) feet from the gutter on each side.

Six (6) Combined Flax and Wool Felt, Composition and Gravel Roof.

First cover the sheathing boards with one (1) layer of dry felt and over this put one (1) layer of flax felt and three thicknesses of wool roofing felt, weighing not less than fifteen (15) pounds (single thickness) to the square of one hundred (100) feet. This felt to be smoothly and evenly laid and well cemented together the full width of the lap, not less than eleven (11) inches between each layer, with best roofing cement, using not less than one hundred and twenty (120) pounds of roofing cement to the square of one hundred (100) feet. The entire surface then to be mopped over with roofing cement and a cap sheet of wool felt applied. All joinings along walls and around openings to be carefully made. The roof to be then covered with a heavy coating of roofing cement and screened gravel, not less than one (1) cubic yard of gravel to six hundred (600) square feet, gravel to be screened through $\frac{5}{8}$ -inch mesh and free from sand and loam. All walls and openings to be flashed. If not, the rear end of the walls to be flashed not less than fifteen (15) feet from the gutter on each side.

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LATH AND PLASTERING

to be measured by the superficial yard, from floor to ceiling for walls, and from wall to wall for ceiling.

In rooms containing one or more horizontal angles between the floor and ceiling line, the ceiling to be measured from wall to wall, as though all walls were vertical, for contents of ceiling, and from floor to highest point of ceiling for height of wall.

OPENINGS.

Openings in plastering to be measured between grounds. No deductions to be made for openings of two feet or less in width. One-half of contents to be deducted for openings two feet or more in width. The contents of all store front openings to be deducted, and the contractor to be allowed one foot six inches for each jamb by the height.

All beams or girders projecting below ceiling line to have one foot in width by total length added for each internal and external angle.

CORNER BEADS, ARCHES, ETC.

All corner angles of more or less than 90 degrees, beads, quirks, rule joints and moldings, to be measured by the lineal foot on their longest extension; add one foot for each stop or miter.

CORNICES.

Length of cornices to be measured on walls. Plain cornices of two feet girt or less to be measured on walls by the lineal foot. Plain cornices exceeding two feet girt to be measured by the superficial foot. Add one lineal foot by girt for each stop or miter. Enriched cornices (cast work), by the lineal foot for each enrichment.

Arches, corbels, brackets, rings, center pieces, pilasters, columns, capitals, bases, rosettes, bosses, pendants and niches, by the piece. Ceiling or frieze plates over eight inches wide, by the square foot.

COLUMNS.

All columns to be measured by the lineal foot.

CEMENT WAINSCOTING.

All cement wainscot to be measured by the square foot, openings to be allowed as for plain plaster.

GROUND.

All grounds for various classes of work to be as follows, unless expressly specified to the contrary:

Grounds for 2-coat lath work	¾ inch
Grounds for 3-coat lath work	7⁄8 inch
Grounds for 3-coat metal lath work	¾ inch
Grounds for 3-coat metal lath work, on ½-inch iron furring	1 inch
Grounds for 3-coat metal lath work, on 1-inch iron furring	1½ inch
Grounds for hard mortar lath work	5⁄8 inch
Grounds for hard mortar metal lath work	1½ inch
Grounds for hard mortar metal lath work, on ½-inch iron furring	7⁄8 inch
Grounds for 2-coat work on brick or tile	½ inch
Grounds for hard mortar on brick or tile	½ inch

Where metal lath is spoken of it applies to all wire or metal lath.

THE LEGAL STANDING OF AN ARCHITECT.

Paper read before the Chicago Architects' Business Association on April 12, 1904,
by Charles N. Goodnow, Attorney at Law.

Before taking up in detail the subject assigned to me for discussion this evening, I desire to preface my remarks with a few general impressions that have been conveyed to me from my several years of experience in connection with the architects of Illinois.

From a careful study of the many and varied interests entrusted to the architect and from the numerous duties imposed upon him if he serves his client advantageously and faithfully, I know of no other profession (and I call the business of an architect a profession) that calls for as wide a range of knowledge, information, skill and sound judgment. It should be classed as a profession, because to do the work well it requires intelligence and artistic temperament and broad general information that comes from a trained mind rather than from skilled hands. The architect must be versed, to a certain extent, in the law of the State and the ordinances of the City wherein he does his work, in order that in the planning of his work he may not run counter to the provisions of the law relative to building; also, that he may not occasion his client useless expense by reason of failure to properly protect him in the contracts which pass through his hands for the construction of the building. He is called upon to act as an adviser in a semi-legal capacity in the protection of his client from liens and damages from the result of acts by parties connected with the construction of the building. He must have a knowledge of sanitation, in order that in the preparation of his plans and specifications the building, when completed, will be sanitary in every respect. He must have a knowledge of electricity, heating and interior decoration. He must have an artistic temperament, in order to construct the building externally so that in outline it is pleasing to the eye, and at the same time retains all its elements of strength. He must be a good draughtsman in order to properly construct his plans in such a way that they are clear and distinct in meaning, and capable of being followed by one less skilled than himself. He must be a mathematician, in order that he may properly compute the strains and weights, and the resisting power of the various materials used in the building. In fact, so many and varied are the requirements necessary that the profession is now dividing itself into specialties—many men following the construction only of dwellings; others, factories; others, public buildings; others, breweries; others, largely churches and theatres. This condition, of course, is simply the outgrowth of the particular line in which an architect at some time in his career becomes engaged and to which his peculiar talents run; but all classes of architects are bound by certain precedents or decisions which have been handed down from time to time by the courts of this country defining their position. It is upon this general branch of the subject that I desire to dwell, and in doing so I will treat the question under the following heads:

1st.—Master and Servant, or his relation with his employer.

2d.—Principal and Agent, or his relation with Third Parties.

3d.—His Rights and Remedies.

In dealing with each subject, time will only allow that I go into the same very briefly, and give only the general proposition or theory of the law governing each subject, and not attempt to give the exceptions that may arise.

Under the first Principle of Law which treats largely of Personal Injuries to himself or others, the architect may assume two positions.

One—when he, strictly speaking, is a servant or employe, and assumes to those working with him the position of a fellow servant.

And another, when he, in a measure, becomes what is termed a Vice Principal.

In order to be classed as a Fellow Servant, he would have to become an employe, devoting his time and energy to the one Master; a salaried man, working in common with all others for the general purpose.

In this position he "assumes the risk incident to his employment, including such as arise from the negligence of a fellow servant engaged in the Common Employment." (McDonald vs. Standard Oil 55a—N. J. 289.)

And if he be injured by reason of the negligence of a fellow servant, or by reason of his negligence, one of his fellow servants is injured, neither could recover from the Master.

And the rule that employees of a Common Master, engaged in the Common Employment of erecting a building, are all fellow servants, is not altered because such employees may be engaged in different departments of the Common Business. (Enright vs. Oliver & Burr 55a—N. J. 277.)

Whether employees of a Common Master are fellow servants, so as to relieve the Master from liability for injuries to one by the negligence of another, is to be

determined by the nature of the act which caused the injury, and not by a difference in the rank or grade of service between the particular servants. (*Galvin vs. Pieve* 72 N. H. 79.)

However, if the architect be employed as above indicated, and by direction of the Master assumes the superintendence of the work, he then becomes a Vice Principal, and the Master may be chargeable with his neglect.

When the Master delegates the duty to provide his servants with a reasonable safe place to work to an agent or employe, such person becomes a Vice Principal, and the Master is liable for his neglect. (*Good Eye Mining Co. vs. Robinson* 73 P. 102.)

And when the Master delegates to the Architect in his employ the duty of drafting the plans and specifications of a building and superintending the construction of the same, he is liable for all injuries that may result from the negligence of the architect.

There is another liability which may arise to the Master: That for "Injuries to Third Persons," "The liability of a Master arising out of an act of negligence committed by his servant does not rest upon the ground that the Master himself was negligent, but upon considerations of Public Policy, which hold him responsible for the acts of his agents when acting about his business." (*Helms vs. Northern Pacific Ry. Co.* 120 F. 389.)

Principal and Agent.

As to the second Principle, that of Principal and Agent, the Architect employed on commission to draft plans and specifications, and superintend the construction of a building, from the many duties which he is called upon to perform, necessarily becomes the agent of his principal. It is therefore necessary that he know fully the extent of his authority, so as not to involve his principal in extra expense or litigation, nor to do something which will cause himself loss.

As a general proposition, the acts of a general agent bind the Principal so long as the agent keeps within the scope of his authority. (*Doan vs. Duncan* 17 Ill. 272. *Taylor vs. Taylor* 20 Ill. 650. *Sterling Bridge Co. vs. Baker* 75 Ill. 139. *U. S. Life Ins. Co. vs. Advance Co.* 80 Ill. 545.)

And also where the agent acts within the scope of his apparent authority, though in excess of authority actually given the General Public or parties dealing with them having no knowledge of the agent's limitation. (*Smith vs. Peoria Co. Sup.* 59 Ill. 412. *Home Life Ins. Co. vs. Pierce* 75 Ill. 426. *Hurd vs. Marpal* 10 Ill. App. 418.)

In the last case while the act will hold the principal to a third party, he may make the agent stand the loss thus occasioned him.

In Case of Torts.

If a Tort or wrong is committed by an agent in the course of his employment while pursuing the business of his principal, and it is not a wilful departure from such employment and business, the principal will be liable for the act, although it is done without his knowledge. (*Noble vs. Cunningham* 74 Ill. 51. *Cooley on Torts*, page 533. *Hamilton vs. Third Ave. Rd. Co.* 53 N. Y. 25.)

It has further been held "that the principal is held liable for the wrongful acts of his agent, if done in the course of his employment as such agent, although the principal did not authorize, justify or participate in such acts, or even if the principal forbade the acts or disproved of them." (*Sackett's Instructions to Juries*, page 60.)

General Instructions of Principal.

It is a well defined principle of law that when the directions of the principal to his agent are general, as to the business which he is intended to perform, then the principal is held to have confided in the discretion of his agent and he will be answerable for all the acts of the agent in the performance of the duty required.

Departure from Business of Principal.

Also, if the directions of the principal to his agent are specific to do some specific thing, and the servant disregards his specific instructions, and goes about doing something else, not reasonably within the scope of the authority given, the master will not be liable for such acts of the servant, unless they are afterward ratified by him. (*Sackett's Instructions*, etc., page 57.)

Notice to an Agent—When Binding.

The architect must remember that when, in the construction of a building, notice is served upon him, or any fact affecting the owner's interest comes to his notice, the owner should at once be notified so he can protect his interests. Our courts have decided "That notice to an agent of any fact concerning the matter of his agency, is the same as notice to the principal. The law presumes that an agent transmits, or in some manner communicates, to his principal all information received by him relating to the matter of his agency." (*Saulsbury vs. Wimberly* 60 Ga. 78. *Roach vs. Carr* 18 Kan. 329. *Taggs vs. Tenn. Nat'l Bk.* 9 Heisk 479.)

The courts of this state have, however, decided "That a party is not chargeable

with notice of facts within the knowledge of his agent or attorney, when the agent or attorney acquires such knowledge while acting as the agent or attorney of another person." (Harrington vs. McCollum 73 Ill. 476. Aultman & T. Co. vs. Webber 4 Ill. App. 427.)

Any failure to notify the owner as above indicated might cause him loss and subject the architect to the charge of neglect of duty, and if loss was sustained by the owner—the architect, as between them, could be held liable.

Good Faith Required of the Agent.

The law and natural justice require that the architect or agent act towards his principal in good faith. And our courts have held that if an agent makes any profit in the course of his agency, by any concealed management in either buying or selling, or other transaction on account of the principal, the profits will belong exclusively to the principal. And a suit would lie against the agent to recover the same by the principal. (Colton vs. Holliday 59 Ill. 176. Glover vs. Layton 145 Ill. 92. Hair Co. vs. Daily 161 Ill. 386. Love et al vs. Hass 62 Ind. 255.)

Rights and Remedies. Architect Acting as Arbitrator.

It is a general proposition of law that the parties to a contract may submit their differences to a third party for arbitration or adjustment, and may agree that his decision shall be final as between them. It makes no difference if the arbitrator acts as the architect for the owner. (Howard vs. Pensacola & A. R. Co., 24 Fla. 560.)

The architect is not disqualified to act as referee, as provided by building contract, because prior to such acting he was called as a witness in an action between the parties involving the matter in dispute. (Barclay vs. Deckerhoof, 171 Pa. St. 378.)

It is frequent to have clauses in building contracts between the owner and contractors, that all the work must be done to the satisfaction of the architect and payment to be made upon certificate issued by him. In passing judgment upon the work it is implied that such officer will not act arbitrarily nor capriciously, but will exercise an honest judgment. In other words, the arbitrator must place a reasonable construction upon the contract as between the parties, and must accept that which an ordinarily prudent man would accept under like circumstances. He is not supposed to be capricious nor can he hold out upon mere technicalities. (United States vs. Northwestern Commercial Co., 74 Fed. 145.)

The term "to the satisfaction of the architect" often leads to much discussion to determine how far the architect may go.

Legal Construction of the Word "Satisfactory."

After an examination of the authorities as to this, there appears to be a distinction made between the character of work to be performed, and the doctrine has been laid down in the case of Gray vs. Alabama National Bank, 10 N. Y. Supreme Court, page 5.

This was a case upon the construction of a contract to make steel plate bank drafts of "a satisfactory design," to be furnished the purchaser.

In this case it was held that the purchaser might refuse the work without assigning any reason for his dissatisfaction. The Court by McAdams, Chief Justice, said:

"There is no doubt of the general proposition that where one party agrees to do a thing to the satisfaction of another, and the excellency of the work is a matter of taste, such, for instance, as a portrait, bust, suit of clothes, dramatic play, or a particular piece of furniture, the employer may reject it without assigning any reason for his dissatisfaction. In such a case, the law cannot relieve against the folly of the employee by inquiring whether the dissatisfaction of the employer was based upon reasonable grounds or not. It is even doubtful whether it can inquire into the good faith of the employer's decision." (Glenney vs. Lacy, 1 N. Y. Supreme Court 513. Campbell Printing Press Co. vs. Thorpe 36 F. R. 414. Seeley vs. Welles 120 Pa. State, page 75, and other cases.)

"There are, however, many decisions where it is said that the decision of the person to be satisfied must be in good faith." (Hartford Mang. Co. vs. Brust, 43 Vt. 528. Daggett vs. Johnson, 49 Vt. 345. McClure vs. Briggs, 58 Vt. 82 and 56 Amer. Reports 557. Singerly vs. Thayer, 108 Pa. State 291.)

"Parties must stand to their contracts as they make them, and if one party agreed to furnish an article that is satisfactory to the other, he constitutes the latter the sole arbiter of his own satisfaction.

"If, however, the task to be performed does not involve a matter of taste, fancy or judgment, but of common experience, such as an ordinary job of mechanical work, or quality of material, a different rule applies, and in such cases, the law will say that what in reason ought to satisfy a contracting party, does satisfy him." (Duplex, etc., Boiler Co. vs. Gardner, 101 N. Y. 87, found in 54th Amer. Reports, page 709; also see Brooklyn vs. Brooklyn City Ry. Co., 47 N. Y., page 475. Miesell vs. Globe Mutual Life Ins. Co., 76 N. Y. 117.)

Liens.

Under the present Lien Law of this State, in force July 1, 1903, an architect is given a lien for his services. And he is regarded as an original contractor where he deals direct with the owner or agent of the owner. It is not necessary, in order to have a lien, that you have a contract specifying the time for the delivery of your plans, or the completion of your work, nor a specific date of payment. There is no particular form of contract provided for. It may be expressed or implied, or partly expressed, or partly implied. The only provision is "that the work be done, or materials furnished within three years of the commencement of the work."

The time for filing your lien as between yourself and the owner, is any time after the contract is made, and within two years after the completion of the contract.

As to third parties or other contractors, you cannot enforce your lien unless within four months after the completion of your contract you bring suit to enforce the lien, or file your claim with the clerk of the Circuit Court. It is, however, necessary to show a delivery of the plans and specifications to the owner, or his duly authorized agent, or the actual services as a superintendent before you can recover.

Liens—Statutory.

By third parties: are intended-purchasers, mortgagees or lienors.

A mechanic's lien is in derogation of the common law. (McLurkin vs. Logan, 23 Ill., page 77. Canisins vs. Merrill, 65 Ill., page 67. Carney vs. Tully, 74 Ill., page 375. Belanger vs. Hersey, 90 Ill., page 70. Butler et al vs. Gain, 128 Ill., page 23. Williams vs. Vanderbilt, 145 Ill., page 238. C. & W. L. R. R. vs. Canble, 4 Bradwell, page 133.)

It is opposed to common right and is a privilege accorded to a particular class. (Gaty vs. Casey, 15 Ill., page 190. Cook vs. Heald, 21 Ill., page 425. Smith vs. Moore, 26 Ill., page 392. Croskey vs. N. W. Mfg. Co., 48 Ill., page 48. Clark vs. Moore, 64 Ill., page 273.)

It is not given as a matter of right, but of statutory grace. (Haines vs. Chandler, 26 Ill. App., page 400.)

Cumulative and Concurrent.

A mechanic's lien is a cumulative remedy. (Delahany vs. Clement, 3 Scam., page 203. Templeton vs. Home, 82 Ill., page 491.)

To the original remedy for debt is added the mechanics lien as an appropriation of the specific thing to secure the debt, and although the lien may be defeated by reason of failure to perform some one of the statutory requirements, the ordinary action of assumpsit will lie, if brought within the time prescribed by the statute of limitation.

If upon sale under decrees of the property held under the lien it does not bring enough to satisfy the debts due, a personal execution may issue for the balance, and any other property owned by the debtor may be seized. (Bouton vs. McDonough Co., 84 Ill., page 384. Baptist Church vs. Andrews, 87 Ill., page 172. Green vs. Sprague, 120 Ill., page 416.)

It is a **Concurrent Remedy** because the creditor can sue for his claim in an action of assumpsit, or attachment, and at the same time enforce his lien by an appropriate action in the same court or different court and may follow both actions until his debt is satisfied by one or the other.

But he can only have one satisfaction of the debt. (West vs. Flemming, 18 Ill., page 248. Cook vs. Heald, 21 Ill., page 425. Culver vs. Elwell, 73 Ill., page 536. Geary vs. Baup, 37 Ill. App., page 301.)

Assignability of Liens.

Under the present act mechanics' liens or claims for liens may be assigned and the holder follow the same as though the original owner. (Sec. 8, Chapter 82, Lien Law.)

Two or more persons having claims for liens may join in one suit, or become a party to any suit pending by filing an intervening petition. (Sec. 9, Chapter 82, Lien Law.)

Receivers.

Under the present act the court has the power to appoint a receiver for property on which a lien is claimed, the same as in a foreclosure suit, or for the purpose of completing the building when it is deemed the best for all parties interested. (Sec. 12, Chapter 82, Lien Law.)

Right of Set-off—Or Counter Claim.

There is another provision in the present law different from the old act, which is of importance to the contractor. Under the old act no offsets or counter claims were allowable in a suit to enforce lien, and if for any reason the right to a lien failed the suit had to be dismissed. However, under the present act, all defenses are allowed and although the lien fail if there is anything due, the contractor may have a judgment as at common law.

That portion of the law is as follows (Sec. 13, Chapter 82):

"The owner shall be entitled to make any defense against the contractor by way of set-off, recoupment or counter claim that he could in any action at law, and shall be entitled to the same right of recovery on proof of such in excess of the claim of the contractor against the contractor only, but for matters not growing out of the contract such recovery shall be without prejudice to the rights of the sub-contractors thereunder for payment out of the contract price or fund; and in event that the court shall find, in any proceeding in chancery, that no right to a lien exists, the contractor shall be entitled to recover against the owner as at law, and the court shall render judgment as at law for the amount which the contractor is entitled to, together with costs in the discretion of the court."

Bids for Work.

When an owner, being about to erect a building, invites proposals or offers from masons, carpenters, etc., specifying the terms upon which they will perform the work, the owner is not bound (in the absence of an express pledge or agreement to that effect) to employ the party who offers to do the work at the lowest price. *N. Y. Topping vs. Swords*, 1 E. D. Smith 609.)

A private person who has asked for bids from contractor on a house that he intends to construct is not bound to award the contract to the lowest bidder, but he has the right to inquire into the fitness and skill of the respective bidders to fulfill the contract. (*Leskie vs. Haseltine*, 155 P. St. 98.)

Acceptance.

To make the bid binding there must be an acceptance, either verbal or in writing. A written proposal by a contractor in response to an invitation therefor by the owners, accepted by the latter, is a contract of the same force and validity as if a formal contract had been written out and signed by the parties. (*Garfield vs. United States*, 93 U. S. 242.)

The fact that on the opening of bids made for the construction of a house, either the person letting the contract or his architect, said to one of the bidders, "You are the lucky man," is merely a recognition that he is the lowest bidder, and is not equivalent to awarding the contract to him. (*Leskie vs. Haseltine*, 155 Pa. St. 98.)

To constitute an awarding of the contract there must be a distinct offer on one hand, and an acceptance of it on the other, showing a concurrence of the minds of the parties upon all the terms of the contract before either party is bound.

This concurrence or agreement may be shown to have been either verbal, or by the terms of an express contract, or a contract may be embraced in letters constituting a correspondence between the parties, or by telegrams, etc. (*Dana vs. Short*, 81 Ill. 468. *Thames Loan & Trust Co. vs. Beville*, 100 Ind. 309.)

And when the parties have fully agreed on the terms of a contract by correspondence, it is not essential that a contract should be formally executed. (*Bourne vs. Shapleigh*, 9 Mo. App. 64.)

Architects' Certificates.

When parties to a building contract agree upon an arbitrator to settle disputes, and where the contract provides that no money is payable hereon except upon the certificate of the architect, the decision of the arbitrator is final, in the absence of fraud or mistake. In *Snell vs. Brown*, 71 Ill. 133, the court laid down the rule as to what is sufficient fraud to reject an architect's decision under such a contract. It was there held, that where a party voluntarily enters into an agreement that a third person shall estimate work done and pass upon its quality, with power to reject and condemn all material which, in his opinion, does not conform to the contract, he cannot avoid or disregard it except for fraud clearly proved. As to what is necessary to constitute sufficient fraud to reject the architect's decision the court says (p. 143):

"It is true, his conduct may be impeached and his estimate set aside for fraud; but fraud cannot, as is assumed in the instructions for appellees, be presumed merely because his estimates for work done pursuant to the terms of the contract are less than the measurement of the quantity actually done. Even if he, by mistake in judgment, erred in condemning or rejecting work, it would be no ground to impeach his estimate. (*Herrick vs. Vermont Central Railway Co. Supra.*) To prove that the estimate is fraudulent, it is not sufficient merely to show that work was rejected or condemned which in the opinion of others should not have been rejected or condemned. This may, indeed, be proved as a circumstance tending, in some degree, to establish fraud, but it is not conclusive. The evidence must show that the architect knowingly and willfully disregarded his duty, and rejected or condemned work which he knew, or at least should have known, fully conformed, in all respects, to the terms of the contract."

In *Canal Trustees vs. Lynch*, 5 Gilm. 521, the court says (p. 526): "The contract between the parties, so far as the record shows, was voluntarily and fairly entered

into. Neither party is at liberty to disregard it, nor can the court make for the parties a contract different from that which the parties have made for themselves. By the terms of the contract under which the work was done, the determination of the chief engineer as to the amount or quantity of the work done is made final and conclusive. In an action for work done under the contract, the estimate of the chief engineer furnishes the only evidence of the amount of work done, and neither party is permitted to show such estimate to be erroneous, or to impeach it except for fraud. If the board of trustees should unreasonably refuse to cause the work to be estimated by their chief engineer, the contractor would then have the right to resort to other evidence to show the amount of work done (*Hotham vs. East India Co.* 1 I. R. 639), but neither party can resort to such other evidence while the other observes and insists upon the contract."

In *McAuley vs. Carter*, 22 Ill. 52, it was held that where parties to a building contract agree that a superintendent should pass upon the work and certify as to the payments to be made, his decision is binding, unless fraud or mistake on his part shall be shown. In this case the court says (p. 57): "This being the contract of the parties, the case on the part of the appellees was made out by producing and proving the final certificate of the superintendent. That was the condition, and the only one, on which their right to recover rested, and when procured it must be held, in the absence of fraud, conclusive. No evidence of the amount of work done, or of its character, was admissible—both parties are concluded by the certificate of the superintendent." It was also held that the same party might lawfully act as the agent for the owner and as arbitrator for the disputes.

In *Michaelis vs. Wolf*, 136 Ill. 68, it was said (p. 71): "Where in a building contract, provision is made for the payment of the price, or a portion or portions of such price, upon the certificate or certificates of the architect in charge of the construction of the building, the obtaining or presentation of such certificate or certificates is a condition precedent to the right to require payment, and such condition must be strictly complied with, or else a good and sufficient excuse shown." To the same effect are *McAvoy vs. Long*, 13 Ill. 147; *Coeys vs. Lehman*, 79 id. 173; *Barney vs. Giles*, 120 id. 154; *Arnold vs. Bournique*, 144 id. 132.

One of the many causes of complaint by architects is the use of their plans by others without authority or compensation.

There are two phases of this subject I desire to touch on.

1st.—Has the original designer of plans such a Proprietary interest in them under the Common Law that they could not be used nor appropriated by another for his use or benefit?

2d.—Whether or not by reason of having used said plans in the erection of a building, there is not a sufficient publication of them to make them public property usable by any person so desiring.

It is a question whether a plan can be copyrighted so that the plan or arrangement of the proposed building can not be reproduced by others. As a general proposition there are two rights guaranteed under the statutes of the United States for all literary productions by a combination of intellectual and mechanical skill. There is what is known as the Common Law Right, or the original right, accruing by reason of the intellectual effort and the mechanical skill required, and the copyright, or the statutory right, which two propositions have been defined as follows:

A copyright is the exclusive right of printing or otherwise multiplying copies of a public intellectual production, and publishing and vending the same and the right of preventing all others from doing so. This is the distinction from the common law right. The word "Copyright" is sometimes used indifferently to denote the statutory and the common law property in intellectual productions. But there are essential differences between the two rights. Copyright, strictly speaking, signifies the exclusive right of the owner of an intellectual production to multiply copies of, and publish the same. It is also called copyright after publication or statutory copyright. But a common-law property in an intellectual production does not include the exclusive right of a continued publication, but only the right to make the first publication. It is sometimes referred to as the Common-law copyright or copyright before publication.

The term is also used as an equivalent of a literary property, but the word copyright and the phrase "literary property" are not generally considered to be synonymous. The latter phrase has a more general signification than copyright, and includes both the right which the producer of an intellectual production has, by the common law and the right which he may obtain therein under the copyright statute; it is a general term which described the interest of an author or those who claim under him in his work, whether before or after publication, or before or after the copyright has been secured.

Literary Property: Literary property is the exclusive right of the owner to possess, use and dispose of intellectual productions.

At Common Law: The right of property in intellectual productions is recognized and protected independently of and notwithstanding the copyright statutes. The existence of common law right is, however, dependent upon whether there has been a publication of the work. (*White vs. Geroch*, 2B, & Ald. 298. *Jones vs. Thorn*, 1 N. Y. Leg. Obs. 408. *Press Pub. Co. vs. Monroe*, 33 Fed. Rep. 196.)

Before Publication: An author has, at common law, a property in his intellectual productions, before it has been published, and may obtain redress against anyone who deprives him of it, or by improperly obtaining a copy, endeavors to realize a profit by its publication. (2 Story, *Equit.* 943.)

Common Law Right in What Productions: And this protection is given to intellectual productions generally, whether they be literary compositions or artistic productions, including not only paintings, etchings, and works of sculpture, but engravings and photographs, or musical compositions.

Control of Publication: The right which the originator of a literary production has at common law before publication, is absolute. If, after publication, the author chooses to keep his productions private, he may do so and has his remedies to prevent publication. If, on the other hand, he communicates them, he may prescribe limitations and impose restrictions as to the extent of their use.

The Right to Withhold Their Publication: See *Jeffery vs. Boosey*, 5 H. O. Cas. 961. *Parsons vs. Prang*, 3 Cliff, U. S. 537.)

"Every new and innocent product of mental labor, which has been embodied in writing, or some other material form, being the exclusive property of its writer, the law securing it to him as such, and restraining every other person from infringing his right, whether the ideas thus unpublished take the shape of written manuscripts of literature, dramatic, or musical compositions, or whether they are the designs or works of ornament, or utility planned by the mind of an artist, they are equally inviolable, while they remain unpublished and the author possesses an absolute right to publish them or not, as he thinks fit, and if he does not desire to publish them, to hinder their publication, either in whole or in part by any one else." (Short on the law of Literary, page 48.)

Under the Extent of the Property: The nature of the right of the owner in any unpublished intellectual productions is analogous to that of the rights of ownership in other personal property. It is governed by the same rules of transfer and succession, and is protected by the same process, and has the benefit of all the remedies accorded to other property, so far as applicable. (*Palmer vs. Dent*, 47 N. Y. 537; 7 Am. Rep. 480. *Jeffreys vs. Boosey*, 418 L. O. Cas. 867.)

The statutory law of England and the U. S. at the present time gives more or less completely to intellectual productions. The copyright statutes of the United States and England as to some of the works produced are synonymous. It appears then, that the question of the publication is, in the United States, and to a lesser extent in England, of importance, both as to the common law right and the statutory copyright. Both may be defeated by publication. The common law property in such works does not cease until there is a dedication to the public by publication. But if there is a publication the common law right is lost, and no statutory copyright can thereafter attach, unless there has first been a compliance with the requirements of the statute.

Restricted Publication: But while an unqualified publication of an intellectual production, such as is made by printing and offering copies for sale, dedicates the contents to the public unless the sole right to reproduce is secured to the originator thereof, or his assignee, under the copyright statutes, there may be a limited publication by communicating the contents by reading, presentation, or restricted private circulation, which will not abridge the rights of the owner any further than necessarily results from the nature and extent of such limited use as he has had or allowed others to make of his work. (*Parten vs. Prang*, 3d Cliff, U. S. 549.)

And such restricted use of the work which does not amount to the dedication thereof, and the public does not interfere, with the rights subsequently to obtain a copyright therefor. Neither will it curtail the right to prevent the unauthorized use thereof by another. It becomes important, therefore, to determine what constitutes publication such as will work an abandonment. (*Keene vs. Kimball*, 16 Gray Mass. 545. *Macklin vs. Richardson*, Ambler 694.)

What Constitutes Publication: To permit a copy of manuscript to be made, or to make a gift of a copy thereof, is not such publication as will amount to abandonment, and the person receiving the copy cannot multiply copies published, or make any other use of the work except with the consent of the owner.

Printing itself cannot amount to a publication for the obvious reason that the book may be withheld from the public long after it is printed.

To constitute a publication, there must be some distribution of the copies, in addition to printing.

But there may be such a qualified distribution of the printed copies, as in the case of their being delivered to a few ascertained persons only, who receive them under conditions expressly or impliedly precluding any ulterior diffusion of the knowledge of their contents, as will not constitute such publication as amounts to a dedication of the work to the public. (See *Wheaton vs. Peter*, 8 Pet. U. S. 591.)

Unless, however, the circulation of copies is restricted both as to persons and purpose, it will amount to a publication. (Am. L. Reg. 33.)

"It may, however, be now considered as established, that when these products are circulated abroad, and published with the author's consent, they become common property, and subject to the free use of the community; or, in other words, that there is no copyright in a published work at common law, and such copyright exists only by statute."

That point has been decided last year in the New York Supreme Court, in which the court said:

Literary Property S. I. (N. Y. Sup. 1903.) Where an architect prepared plans and specifications for a client for which he was paid a certain fee, and filed such plans and specifications with the building department of the city in which the residence was constructed, he thereby published the same and had no further property rights in them sufficient to entitle him to recover for the subsequent use thereof in the construction of another building by a third person. (*Wright vs. Eisle*, 83 N. Y. Sup. 887.)

When an architect prepared plans and specifications for a building for a client for a certain compensation, such plans, if valuable as property after their publication, belong to the client, and not to the architect. (*Wright vs. Eisle*, 83 N. Y. Sup. 887.)

In my opinion the only way an architect can preserve a property right in his plans is to provide by contract that the owner only has a right to use the plans for a specific purpose—to-wit: the erection of the building for which the plans were made.

Regarding "An Act to Provide for the Licensing of Architects and Regulating the Practice of Architecture as a Profession."

The benefits derived from the license law in this state to the architects and the public at large are now beginning to be more fully appreciated, and as the law becomes better known and time intervenes it will tend to raise the standard of intelligence and the excellency of the work and make the profession looked up to as one of the best in the state.

There are certain features of the law but little understood, the scope of which are broad enough to compel honesty of conduct and carefulness of construction and superintendence. I refer to section ten, which states that an architect's license may be revoked "for gross incompetency, or recklessness in the construction of building, or for dishonest practices." It also provides for a trial by the board of examiners, and gives the board the powers of a court of record with power to compel the attendance of witnesses, and to revoke a license for either cause.

This power should not be regarded lightly by the profession, for any infringement means a prosecution. A fair trial is always assured, for the right to call witnesses and appear by attorney is always given. But a conviction means that summary action will be taken disastrous to the parties concerned. In this profession, as well as all others, the members, as well as the public at large demand that all incompetent persons should be prohibited from practice. It is a simple question of public safety that demands it, and the Board of Examiners' sworn duty to enforce it. Incompetency can be easily determined, there are so many well defined principles in the architectural profession that an examination of the defendant would clearly show his intelligence and ability to construct a building according to approved methods.

The question of recklessness is a harder proposition. Incompetency hardly enters into it, except when an incompetent architect takes chances on his building standing. A fully competent architect may seem reckless and yet succeed in his enterprise. For this we term him "progressive in ideas." If he fails he is condemned as reckless and may be regarded incompetent. Recklessness in the construction of buildings is found more often in the method of construction or superintendence of the erection of the building. Faultily drawn plans or specifications are classed as **incompetency**, for the architect should have known better and followed along safe lines. Recklessness may follow by constructing from such plans, or when the plans and specifications are correct in every detail, in adopting a method of erecting the building that is unsafe or liable to result in loss of life or property. Recklessness consists in taking a **chance**, or as it is sometimes termed gambling on the probability of success or failure, done, no doubt, by reason of change of conditions, making necessary something not figured on in the first place, or in order to save the owner money or time.

But I contend that no man who values his reputation can afford to take a chance upon that which there is the least possible liability for damage to either persons or

property. If he does he is liable for the same. If complaint be made against him before the state board it may result in the loss of his license.

The term **Dishonest Practice** as used in section ten is not very well defined, but is broad enough to cover almost any act that would be contrary to law or not according to the code of a gentleman, but must be confined to acts pertaining to his profession only.

It has been held that an architect who places his seal of an architect upon plans drawn by another not an architect, for the purpose of permitting those plans to be used for the construction of a building, is guilty of a dishonest practice, for the reason that it enables one not an architect to draw plans and practice as an architect, and thus evade the law, and one who evades the law or assists another to do so is a violator of the law and such an act would be dishonest.

A conviction before the board of examiners on this charge would mean the loss of your license. The architect cannot escape from the above proposition unless he assumes entire responsibility for the plans. He must make them his own in every detail as though they were drawn by him. No cursory examination of the plans will do. No assuming that because the other has gone over it and seems satisfied, therefore you can assume that his figuring and estimates are correct, and accept them, and although you may regard yourself as only consulting architect, still when your seal goes on the plans you and you only stand before the world as sponser for the plans. While the mere act of placing the seal of an architect upon the plans may be necessary to obtain a permit to build, yet to the public it is a guarantee that the skill and intelligence of a mind trained to this kind of work has gone into the make-up of the plans.. It is a guaranty to the workman on the building that in following your plans and specifications he runs no risk of injury, and to the contractors and owner it means some one who may be responsible.

Section 5, latter part, also contains another provision in which a failure to keep, may be cause for revocation—that of filing your license in every county in the state where you are doing work. It does not mean filing in your home county, but in any one or more counties in which you are doing work. The reason for this is apparent. Section 11 requires the secretary of the board to notify all county clerks of the revocation of licenses to practice in this state. The failure to file would remove the check which the board has upon those practising who have no license or whose license has been revoked.

Implied Skill.

When a person engages to work for another he impliedly contracts that he has a reasonable amount of skill for the employment, and that he will use it, as well as reasonable care and diligence; and a failure to do so, to the injury of his employer, will prevent him from receiving the full contract price.

The employer may recoup or set-off against the contract price the damages he may sustain for want of reasonable skill, or the observance of reasonable care and diligence in the performance of the work. (Parsons on Contract, page 54. Parker vs. Platt, 74 Ill., page 430. Garfield vs. Hub, 54 Ill., page 427.)

When a person holds himself out to the public, or to those hiring him, as a person having the requisite experience and skill to perform any work or services requiring special knowledge or skill, he impliedly warrants that he possesses such knowledge as will enable him to do the work and perform the services in a workmanlike and in an ordinarily skillful manner.

Now, in conclusion, let me say, one who holds himself out to the public as an architect, a lawyer, a physician or other profession, is presumed by the law to be learned and skilled in all that goes to make up that profession, there is what we might term a warranty that he is competent and qualified to follow that calling. The law has fixed a warranty upon the original manufacturer that the article he manufactured, be so constructed as to perform that for which it was manufactured or intended, and the same principle applies to the professions as well as to a manufacturer, so that if the architect fails in any of those essential details, or, lacks the skill necessary to perform his work in a proper manner, he is responsible to his principal and may be made to respond in damages if any result from such cause. As to the public at large, his principal may be called upon for damages, if any there be, by reason of the architect's failure to properly construct the building, or to safe-guard his interests, and those working under and around him, may sustain loss and injury without hope of compensation by reason of his negligence or lack of skill.

But with all the demands placed upon this profession, with all the obligations he owes to his principal, his fellow servants or the public at large, it opens up one of the widest fields for the display of intelligence, mechanical skill, artistic ability, honesty of action, and integrity of purpose. And if followed with the firm purpose of giving effect to all of its magnificent possibilities, it can not fail to develop the better part of man, create highest ideals, and a broader conception of the motive and design for our own Creation by that August Architect of the Universe.

MISCELLANEOUS AND USEFUL INFORMATION.

Useful Notes.

Roof boards weigh about three pounds per superficial foot.

Terra cotta tiling weighs from 25 to 35 pounds per square foot.

Hollow tile for five-inch partition weighs from 22 to 35 pounds per superficial foot.

Lath and plastering, two-coat work, weighs from 9 to 12 pounds per superficial foot.

The weight of a superficial foot of brickwork eight inches thick, including mortar, is from 83 to 87 pounds.

An iron roof 100 feet wide, with a rise of one-third pitch, will weigh from 10 to 15 pounds per superficial foot.

One hundred pounds per square foot distributed uniformly over a surface of a bridge is a safe working standard.

The weight per square foot of roof tiling, set in iron or between wood rafters ready for slating, is about 12 pounds.

A fireproof floor constructed of iron beams and four-inch brick arches will weigh from 65 to 75 pounds per superficial foot.

The safe and proper bearing of joist, timber and girders supporting a floor should not exceed ten tons on brick walls and fourteen tons on good stone walls.

A fireproof floor constructed of iron beams and of iron arches made of No. 18 iron, and filled in on top with concrete or slag and cement, will weigh about the same as brickwork four inches thick.

Smallest convenient size of slab for a 14-inch washbowl, 21 by 24 inches. Height of slab from floor, 2 feet 6 inches. Very small (12) inch corner washbowl: slab 1 foot 11 inches each side.

Space occupied by water closets, 2 feet 6 inches wide, 2 feet deep.

Urinals should be not less than 2 feet 2 inches between partitions; partitions 6 feet high.

Horse Stalls.—Width, 3 feet 10 inches to 4 feet, or over 5 feet in width and 9 feet long. Width should not be between 4 and 5 feet, as in such cases the horse is liable to cast himself.

Pitch of Tin, Copper or Tar and Gravel Roof.—Five-eighths of an inch to the foot and upward.

A load of mortar measures a cubic yard, requires a cubic yard of sand and nine bushels of lime, and will fill thirty hods.

A bricklayer's hod measuring one foot four inches by nine inches, equals 1,296 cubic inches in capacity, and contains twenty bricks.

A single load of sand or other materials equals a cubic yard.

One thousand bricks closely stacked occupy about fifty-six cubic feet.

One thousand old bricks cleaned and loosely stacked occupy about seventy-two cubic feet.

One hundred yards of plastering will require fourteen hundred laths, four and a half bushels of lime, four-fifths of a load of sand, nine pounds of hair and five pounds of nails, for two-coat work.

A bushel of hair weighs, when dry, about fifteen pounds.

Flashings.—By "flashings" are meant pieces of tin, zinc or copper laid over slate, and up against wall, chimneys, copings, etc.

Counter flashings are of lead or zinc, and are solid between the courses in brick, and turned down over the flashings.

In flashing against stonework, grooves should be cut to receive the counter flashing.

Water.

- 1 cubic foot of water equals 62.5 pounds, or 7.48 U. S. gallons.
 1 cubic inch of water equals .036 pounds.
 1 cubic foot of water equals 6.2355 Imp. gallons or 7.48 U. S. gallons.
 1 cylindrical foot of water equals 49.1 pounds or 5.89 U. S. gallons.
 1 U. S. gallon of water equals 8.34 pounds.
 1 U. S. gallon of water equals 231 cubic inches.
 1 pound pressure per square inch is equivalent to a head of water of 2.3093 feet;
 1 pound—27.71 inches; 14.7 pounds or 1 atmosphere—33.947 feet, or 10.347 metres; 0.433 pound or 1 atmosphere—1 foot; 43.3 pounds—100 feet.

Capacity of Cisterns.

For a circular cistern, square the diameter and multiply by .7854, for the area; multiply this by 1,728 and divide by 231, for number of gallons of one foot in depth; for a square cistern, multiply length by breadth, and proceed as above.

CIRCULAR CISTERN.

5 feet in diameter holds	4.66 bbls.
6 feet in diameter holds	6.71 bbls.
7 feet in diameter holds	9.13 bbls.
8 feet in diameter holds	11.93 bbls.
9 feet in diameter holds	15.10 bbls.
10 feet in diameter holds	18.65 bbls.

SQUARE CISTERN.

5 feet by 5 feet holds	5.92 bbls.
6 feet by 6 feet holds	8.54 bbls.
7 feet by 7 feet holds	11.63 bbls.
8 feet by 8 feet holds	15.19 bbls.
9 feet by 9 feet holds	19.39 bbls.
10 feet by 10 feet holds	23.74 bbls.

Tests for Pure Water.

Color: Fill a clean long bottle of colorless glass with the water; look through it at some black object. It should look colorless and free from suspended matter. A muddy or turbid appearance indicates soluble organic matter or solid matter in suspension. **Odor:** Fill the bottle half full, cork it, and leave it in a warm place for a few hours. If when uncorked it has a smell the least repulsive, it should be rejected for domestic use. **Taste:** If water at any time, even after heating, has a disagreeable taste, it should be rejected.

A simple semi-chemical test is known as the "Heisch test." Fill a clean pint bottle three-fourths full of the water; add a half-teaspoonful of clean granulated or crushed loaf sugar; stop the bottle with glass or a clean cork and let it stand in a light and moderately warm room for forty-eight hours. If the water becomes cloudy, or milky, it is unfit for domestic use.

Expansion of Water (Dalton).

Temperature.	Expansion.	Temperature.	Expansion.	Temperature.	Expansion.
22°	1.0009	72°	1.0018	152°	1.01934
32	1	92	1.00477	172	1.02575
*46	1	112	1.0088	192	1.03265
52	1.00021	132	1.01367	212	1.0466

*Greatest density at 39.1° Fahr.

Table showing the velocity of discharge of different sized sewers.

Diam. of pipe.	180 feet per minute, 3 feet per second.		270 feet per minute, 4½ feet per second.		360 feet per minute, 6 feet per second.		540 feet per minute, 9 feet per second.	
	Fall.	Gallons per minute.	Fall.	Gallons per minute.	Fall.	Gallons per minute.	Fall.	Gallons per minute.
3.....	1 in 69	54	1 in 30.4	81	1 in 17.2	108	1 in 7.6	162
4.....	1 in 92	96	1 in 40.8	144	1 in 23.	192	1 in 10.2	288
6.....	1 in 138	216	1 in 61.2	324	1 in 34.5	432	1 in 15.3	648
9.....	1 in 207	495	1 in 92.	742.5	1 in 51.7	990	1 in 23	1,485

Rules for Calculating Speed of Pulleys.

I.—The diameter of the driver and driven being given, to find the number of revolutions of the driven:

Rule.—Multiply the diameter of the driver by its number of revolutions, and divide the product by the diameter of the driven; the quotient will be the number of revolutions.

II.—The diameter and the revolutions of the driver being given, to find the diameter of the driven, that shall make any given number of revolutions in the same time:

Rule.—Multiply the diameter of the driver by its number of revolutions, and divide the product by the number of revolutions of the driven; the quotient will be its diameter.

III.—To ascertain the size of the driver:

Rule.—Multiply the diameter of the driven by the number of revolutions you wish to make, and divide the product by the revolutions of the driver; the quotient will be the size of the driver.

Belts.

Leather belts must be well protected against water, and even moisture.

India-rubber is the proper substance for belts exposed to the weather.

It is desirable to run the grain (hair) side of leather belts on the pulley, in order that the strongest part of the belt may be subject to the least wear.

Leather belts run with grain side to the pulley will drive thirty per cent more than if run with flesh side. The belt, as well as the pulley, adheres best when smooth, and the grain side adheres best because it is smoothest.

The transmitting power of a double belt is to that of single belt as 10 is to 7. In ordering pulleys, the kind of belt to be used should always be specified.

Belts should be kept soft and pliable. For this purpose blood-warm tallow, dried in by heat of fire or the sun, is advised. Castor-oil dressing is also good.

The motion of driving should run *with* and not *against* the laps of the belts.

If too great a distance is attempted, the weight of the belt will produce a very heavy sag, drawing so hard on the shaft as to produce great friction in the bearings, while at the same time the belt will have an unsteady, flapping motion, which will destroy both the belt and machinery.

If possible to avoid it, connected shafts should never be placed one directly over the other, as in such case the belt must be kept very tight to do the work. For this purpose belts should be carefully selected of *well-stretched* leather.

It is desirable that the angle of the belt with the floor should not exceed 45 degrees. It is also desirable to locate the shafting and machinery so that belts should run off from each shaft in opposite directions, as this arrangement will relieve the bearings from the friction that would result when the belts all pull one way on the shaft.

The diameter of the pulleys should be as large as can be admitted.

The pulley should be a little wider than the belt required for the work.

When it is not convenient to measure with the tape line the length required, apply the following rule: Add the diameter of the two pulleys together, divide the result by 2, and multiply the quotient by $3\frac{1}{4}$, then add this product to twice the distance between the centers of the shafts, and you have the length required.

The width of belt needed depends on three conditions: 1. The tension of the belt. 2. The size of the smaller pulley, and the proportion of the surface touched by the belt. 3. The speed of the belt.

The working adhesion of a belt to the pulley will be in proportion both to the number of square inches of belt contact with the surface of the pulley and also to the arc of the circumference of the pulley touched by the belt. This adhesion forms the basis of all right calculation in ascertaining the width of belt necessary to transmit a given horse-power.

The average width of a shingle is four inches. Hence, when shingles are laid four inches to the weather each shingle averages 16 square inches, and 900 are required for a square of roofing (100 square feet). If $4\frac{1}{2}$ inches to the weather, 800; 5 inches, 720; $5\frac{1}{2}$ inches, 655; 6 inches, 600.

Weight per Square Foot of Sheet Lead.

$\frac{1}{32}$ inch thick.....	2 lbs.	$\frac{1}{10}$ inch thick.	7 lbs.
$\frac{3}{64}$ " "	$2\frac{1}{2}$ "	$\frac{1}{8}$ " "	8 "
$\frac{1}{16}$ " "	3 "	$\frac{3}{32}$ " "	10 "
$\frac{5}{32}$ " "	4 "	$\frac{1}{6}$ " "	12 "
$\frac{1}{8}$ " "	5 "	$\frac{5}{32}$ " "	14 "
$\frac{3}{16}$ " "	6 "	$\frac{1}{4}$ " "	16 "

Gauges and Their Equivalents.

No. 27, equal to $\frac{1}{64}$ inch.	No. 12, equal to $\frac{7}{64}$ inch.
" 21, " " $\frac{1}{32}$ "	" 10, " " $\frac{1}{8}$ "
" 18, " " $\frac{3}{64}$ "	" 8, " " $\frac{1}{16}$ "
" 16, " " $\frac{1}{16}$ "	" 6, " " $\frac{3}{64}$ "
" 14, " " $\frac{5}{64}$ "	" 5, " " $\frac{3}{32}$ "
" 13, " " $\frac{3}{32}$ "	" 4, " " $\frac{1}{4}$ "

Capacity of Drain Pipe.

SIZE OF PIPE.	GALLONS PER MINUTE.							
	$\frac{1}{2}$ -in. Fall per 100 ft.	3-in. Fall per 100 ft.	6-in. Fall per 100 ft.	9-in. Fall per 100 ft.	12-in. Fall per 100 ft.	18-in. Fall per 100 ft.	24-in. Fall per 100 ft.	36-in. Fall per 100 ft.
3-inch	21	30	42	52	60	74	85	104
4 "	36	52	76	92	108	132	148	184
6 "	84	120	169	206	240	294	338	414
9 "	232	330	470	570	660	810	930	1140
12 "	470	680	960	1160	1360	1670	1920	2350
15 "	830	1180	1680	2040	2370	2920	3340	4100
18 "	1300	1850	2630	3200	3740	4600	5270	6470
20 "	1760	2450	3450	4180	4860	5980	6850	8410

Grade per Mile.

The following table will show the grade per mile:

An inclination of

1 foot in 15 is 352 feet per mile.	1 foot in 40 is 132 feet per mile.
1 foot in 20 is 264 feet per mile.	1 foot in 50 is 106 feet per mile.
1 foot in 25 is 211 feet per mile.	1 foot in 100 is 53 feet per mile.
1 foot in 30 is 176 feet per mile.	1 foot in 125 is 42 feet per mile.
1 foot in 35 is 151 feet per mile.	

To find quantity of water elevated in one minute running at 100 feet of piston speed per minute: Square the diameter of the water cylinder in inches and multiply by 4. Example: Capacity of a 5-inch cylinder is desired. The square of the diameter (5 inches) in 25, which, multiplied by 4, gives 100, the number of gallons per minute (approximately).

To find the depth of a joist, the length of bearing and the thickness being given:

Rule.—Divide the square of the length in feet by the thickness in inches, and the cube root of the quotient, multiplied by 2.2 for pine, or 2.3 for oak, will be the depth in inches.

Slatting.

Slatting is estimated by the "square," which is the quantity required to cover 100 square feet. The slates are usually laid so that the third laps the first three inches.

Number of Slates per Square.

Size in Inches.	Pieces per Square.	Size in Inches.	Pieces per Square.	Size in Inches.	Pieces per Square.
6 × 12	533	8 × 16	277	12 × 20	141
7 × 12	457	9 × 16	246	14 × 20	121
8 × 12	400	10 × 16	221	11 × 20	137
9 × 12	355	9 × 18	213	12 × 22	126
7 × 14	374	10 × 18	192	14 × 22	108
8 × 14	327	12 × 18	160	12 × 24	114
9 × 14	291	10 × 20	169	14 × 24	98
10 × 14	261	11 × 20	154	16 × 24	86

The weight of slate per cubic foot is about 174 pounds, or per square foot of various thicknesses as follows:

Thickness in inches.....	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$
Weight in pounds.....	1.81	2.71	3.62	5.43	7.25

Handy Table.

Diameter of a circle $\times 3.1416$ = circumference.
 Radius of a circle $\times 6.283185$ = circumference.
 Square of the diameter of a circle $\times 0.7854$ = area.
 Square of the circumference of a circle $\times 0.07958$ = area.
 Half the circumference of a circle \times half its diameter = area.
 Circumference of a circle $\times 0.159155$ = radius.
 Square root of the area of a circle $+ 0.56419$ = radius.
 Circumference of a circle $\times 0.31831$ = diameter.
 Square root of the area of a circle $\times 1.12838$ = diameter.
 Diameter of a circle $\times 0.86$ = side of inscribed equilateral triangle.
 Diameter of a circle $\times 0.7071$ = side of an inscribed square.
 Circumference of a circle $+ 0.225$ = side of an inscribed square.
 Circumference of a circle $\times 0.282$ = side of an equal square.
 Diameter of a circle $\times 0.8862$ = side of an equal square.
 Diameter of a circle $\times 0.8862$ = side of an equal square.
 Base of a triangle $\times \frac{1}{2}$ the altitude = area.
 Multiplying both diameters and .7854 together = area of an ellipse.
 Surface of a sphere $\times \frac{1}{6}$ of its diameter = solidity.
 Circumference of a sphere \times its diameter = surface.
 Square of the diameter of a sphere $\times 3.1416$ = surface.
 Square of the circumference of a sphere $\times 0.3183$ = surface.
 Cube of the diameter of a sphere $\times 0.5236$ = solidity.
 Cube of the radius of a sphere $\times 4.1888$ = solidity.
 Cube of the circumference of a sphere $\times 0.016887$ = solidity.
 Square root of the surface of a sphere $\times 0.56419$ = diameter.
 Square root of the surface of a sphere $+ 1.772454$ = circumference.
 Cube root of the solidity of a sphere $\times 1.2407$ = diameter.
 Cube root of the solidity of a sphere $\times 3.8978$ = circumference.
 Radius of a sphere $\times 1.1547$ = side of inscribed cube.
 Square root of ($\frac{1}{3}$ of the square of) the diameter of a sphere = side of inscribed cube.
 Area of its base $\times \frac{1}{3}$ of its altitude = solidity of a cone or pyramid, whether round, square, or triangular.
 Area of one of its sides $\times 6$ = surface of a cube.
 Altitude of trapezoid $\times \frac{1}{2}$ the sum of its parallel sides = area.

Table for Mixing Paints.

In forming the following named colors, mix as they come in order, the predominant being first; second, next; third, next, and so on:

Gray—use white lead and lampblack.

Buff—use white lead, yellow ochre and red.

Pearl—use white, black and blue.

Orange—use yellow and red.

Purple—use violet, red and white.

Gold—use white, stone ochre and red.

Olive—use yellow, blue, black and white.

Chestnut—use red, black and yellow.

Flesh—use white, yellow ochre and vermillion.

Limestone—use white, yellow ochre, black and red.

Fawn—use white, yellow and red.

Chocolate—use raw umber, red and black.

Drab—use white, raw and burnt umber; or, white, yellow ochre, red and black.

Bronze-Green—use chrome green, black and yellow; or, black and yellow; or, yellow, black and green.

Pea-Green—use white and chrome green.

Rose—Use white, madder and lake.

Copper—use red, yellow and black.

Lemon—use white and yellow.

Snuff—use yellow and vandyke brown.

Shingle Stains.

Should contain a large amount of creosote for their base, and the highest grades of English ground colors, and the proper amount of fixative oil to make the colors durable and lasting. Stains are artistic colorings, and give an effect that can be got in no other way. Stains can be applied with a brush, as paint is, after the shingles are laid, or the shingles can be dipped in the stain. The coloring effect is about the same in either case, but the dipping preserves the shingles best.

Covering capacity, based on the regulation sawed cedar shingle, 4 by 16, is as follows: One brush coat, 1 gallon to 150 square feet of surface; two brush coats, 1 gallon to 100 square feet of surface; dipping, $2\frac{1}{2}$ gallons to $2\frac{3}{4}$ gallons to 1,000 shingles; dipping, and applying one brush coat after the shingles are laid, 3 gallons to 1,000 shingles. But two-thirds the length of the shingle need be dipped. When the roof-water is to be used for drinking, it should be turned off from the cistern until two or three hard rains have washed off the superfluous stain.

Dimensions of a Barrel.—Diameter of head, 17 inches; bung, 19 inches; length, 28 inches; volume, 7,680 cubic inches.

One coat or priming will take, for 100 yards of painting, twenty pounds of lead and one and one-fourth gallons of oil. Two-coat work, forty-five pounds of lead and two and one-half gallons of oil: three-coat work, seventy pounds of lead and three and three-fourths gallons of oil.

A box 24 inches long by 16 inches wide and 28 inches deep will contain a barrel, or three bushels; 24 by 16 inches and 14 inches deep contains half a barrel; 16 inches square and $8\frac{2}{3}$ inches deep will contain one bushel; 16 by $8\frac{2}{3}$ inches and 8 inches deep will contain half a bushel; 8 by $8\frac{2}{3}$ inches and 8 inches deep will contain one peck; 8 inches square and $4\frac{1}{2}$ inches deep will contain one gallon; 7 by 4 inches and $4\frac{1}{2}$ inches deep will contain half a gallon; 4 inches square and $4\frac{1}{2}$ inches deep will contain one quart; 4 feet long, 3 feet 5 inches wide and 2 feet 8 inches deep will contain one ton of coal, or 36 cubic feet.

Hot-Water and Steam Heating—Overhead System.

In using steam for the heating of high buildings, it is necessary to use the overhead plan, unless some automatic system of expelling the air is adopted. It requires less power to force the air through the standpipe than it would through a large number of risers. The air is forced out on the descent of the steam, and less fuel and power are necessary.

The overhead hot-water system is coming into general use, as it can be put in so that the farthest radiators in a building will heat at the same time as those nearer the boiler, and the result will also be felt in rooms in the basement—the principle of the siphon causing the effect.

The pipes from the main in the attic, from which the several branches are taken, can be pitched so that heat in the several parts of a building will result as quickly as desired; either an open or closed tank can be used. The pipes exposed in attic should be covered. Opinions vary as to the sizes of pipe to be used.

RADIATION REQUIRED UNDER ORDINARY EXPOSURE.

	Width.	Length.	Height.	Ratio.	Square feet of radiation.
Parlor.....	15.6	16.6	10.0	50	51
Dining room.....	12	16.6	10.0	60	34
Hall.....	12	12	10.0	25	57
Chamber, front.....	13.6	15.6	9.6	55	36
Chamber, rear.....	12.6	16.6	9.6	60	32
Chamber.....	12.6	17	9.6	60	23
Bathroom.....	7	8	9.6	55	9
Chamber, attic.....	12.3	17	9	76	24
Chamber, rear.....	12.6	13.3	9	80	18

List of Sizes of Steam Mains.

To determine the size of pipes no fixed rule can be given which will apply in all cases. A rule that has generally been accepted by steam fitters as good practice, is to allow the area of a one-inch pipe (.7854 square inches) for every 100 square feet of radiating surface, including mains.

Radiation.	One-pipe work.	Two-pipe work.
40 to 50 square feet.....	1 inch.....	$\frac{3}{4}$ x $\frac{3}{4}$ inch
100 to 125 square feet.....	$1\frac{1}{4}$ inch.....	1 x $\frac{3}{4}$ inch
125 to 250 square feet.....	$1\frac{1}{2}$ inch.....	$1\frac{1}{4}$ x 1 inch
250 to 400 square feet.....	2 inch.....	$1\frac{1}{2}$ x $1\frac{1}{4}$ inch
400 to 650 square feet.....	$2\frac{1}{2}$ inch.....	2 x $1\frac{1}{2}$ inch
650 to 900 square feet.....	3 inch.....	$2\frac{1}{2}$ x 2 inch
900 to 1,250 square feet.....	$3\frac{1}{2}$ inch.....	3 x $2\frac{1}{2}$ inch
1,250 to 1,600 square feet.....	4 inch.....	$3\frac{1}{2}$ x 3 inch
1,600 to 2,050 square feet.....	$4\frac{1}{2}$ inch.....	4 x $3\frac{1}{2}$ inch
2,050 to 2,500 square feet.....	5 inch.....	$4\frac{1}{2}$ x 4 inch
2,500 to 3,600 square feet.....	6 inch.....	5 x $4\frac{1}{2}$ inch
3,600 to 5,000 square feet.....	7 inch.....	6 x 5 inch
5,000 to 6,500 square feet.....	8 inch.....	7 x 6 inch
6,500 to 8,100 square feet.....	9 inch.....	8 x 6 inch
8,100 to 10,000 square feet.....	10 inch.....	9 x 6 inch

Tin Roofs.

Tin roofs should be laid with cleats.

There are two kinds of tin—"bright tin," the coating of which is all tin, that is, the tin proper; and "tern," "leaded," or "roofing" tin, the coating of which is a composition, part tin and part lead. This last will not rust any quicker, but the sulphur in soft coal smoke eats through the "leaded" coating sooner than through the "tinned."

Sizes of tin, 10 by 14 and 14 by 20, and two grades of thickness—IC light, and IX, heavy. For a steep roof (one-sixth pitch or over) the IC 14 by 20 tin ("leaded" if high up where little smoke will get to it; "bright" if low down), put on with a standing groove, and with the cross seams put together with a double lock, makes as good a roof as can be made. For flat roofs IX 10 x 14 "light" is best, laid with cleats, but the others make good roofs and any of them will last twenty-five years at least, if painted periodically.

Number of Square Feet a Box of Roofing Tin Will Cover.—For flat seam roofing, using $\frac{1}{2}$ -inch locks, a box of "14 by 20" size will cover about 192 square feet, and for standing seam, using $\frac{3}{8}$ -inch locks and turning $1\frac{1}{4}$ and $1\frac{1}{2}$ inch edges, making 1-inch standing seams, it will lay about 168 square feet.

For flat seam roofing, using $\frac{1}{2}$ -inch locks, a box of "28 by 20" size will cover about 399 square feet, and for standing seam, using $\frac{3}{8}$ -inch locks and turning $1\frac{1}{4}$ and $1\frac{1}{2}$ inch edges, making 1-inch standing seams, it will lay about 365 square feet.

Every box of roofing plates (IC or IX "14 by 20" or "28 by 20" sizes) contains 112 sheets.

Strains.

Tension, as in the case of a weight suspended from one end of a rod, rope, tie-bar, etc., the other end being fixed, tending to stretch or lengthen the fibers.

Shearing strain, as in the case of tree nails, pins in bridges, etc., where equal forces are applied on opposite sides in such a manner as to tend to force one part over the adjacent one.

Compression, as in the case of a weight resting on top of a column or post, tending to compress the fibers.

Transverse or cross strain, as in the case of a load on a beam tending to bend it.

Torsion, a twisting strain, which seldom occurs in building construction, though quite frequently in machinery.

Important Points in Figuring Dimensions of a Stable.

The proper height and width of a stable door is not less than nine feet square. Width and height of vehicles is as follows:

	Height.		Length.	Width.	
	Ft.	In.	Ft.	Ft.	In.
Brougham	7	0	11	6	0
Rockaway	7	0	11	6	0
Victoria	7	6	12	6	0
Demi-coach	7	0	12	6	0
Phaeton	8	6	10	6	0
Berlin Coach	7	6	13	6	6
Landau	7	6	13	6	6
Double suspension victoria.....	8	0	13	7	0
Vis-a-vis	7	0	12	6	0
Body brake	9	0	11	7	0
Goddard phaeton	8	0	9	6	0
Stanhope	8	0	9	6	0
Buggy	9	0	9	6	0
Single trap	6	0	9	6	0
Mail coach	9	0	15	7	6
Omnibus	8	0	11	7	0

Metric Tables.

	Approximate. Equivalent		Accurate Equivalent.
1 inch	[length].. $2\frac{1}{2}$	cubic centimeters	2.539
1 centimeter	0.4	inch	0.393
1 yard	1	meter	0.914
1 meter (39.37 inches).....	1	yard	1.093
1 foot	30	centimeters	30.479
1 kilometer (1,000 meters).....	$\frac{5}{8}$	mile	0.621
1 mile	$1\frac{1}{2}$	kilometers	1.600
1 gramme	[weight].. $15\frac{1}{2}$	grains	15.432
1 grain.....	0.064	gramme	0.064
1 kilogramme (1,000 grammes).....	2.2	pounds avoirdupois.....	2.204
1 pound avoirdupois	$\frac{1}{2}$	kilogramme	0.453
1 ounce avoirdupois ($437\frac{1}{2}$ grains).....	$28\frac{1}{3}$	grammes	28.349
1 ounce troy, or apothecary (480 grains).....	31	grammes	31.103
1 cubic centimeter	[bulk].. 1.06	cubic inch	1.060
1 cubic inch.....	$16\frac{1}{3}$	cubic centimeters	16.386
1 liter (1,000 cubic centimeters).....	1	U. S. standard quart.....	0.946
1 United States quart.....	1	liter	1.057
1 fluid ounce.....	$29\frac{1}{2}$	cubic centimeters	29.570
1 hectare (10,000 square meters) [surface]	$2\frac{1}{2}$	acres	2.471
1 acre	0.4	hectare	0.40

In the nickel five-cent piece of our coinage is a key to the tables of linear measures and weights. The diameter of this coin is two centimeters, and its weight is five grammes. Five of them placed in a row will give the length of the decimeter, and two of them will weigh a decagram. As the kiloliter is a cubic meter, the key to the measure of length is also the key to the measure of capacity.

Size of the Billiard Room, Gas Light, Etc.

The space required for the different sized tables is as follows:

For table 6 x 12.....	Room should be 16 x 22
For table $5\frac{1}{2}$ x 11.....	Room should be $15\frac{1}{2}$ x 21
For table 5 x 10.....	Room should be 15 x 20
For table $4\frac{1}{2}$ x 9.....	Room should be 14 x $18\frac{1}{2}$
For table 4 x 8.....	Room should be 13 x 17
For table $3\frac{1}{2}$ x 7.....	Room should be $12\frac{1}{2}$ x 16

The following directions for arranging the lights over billiard tables will be found useful. The distance of the light from the floor should be about 6 feet 2 inches. For a $5\frac{1}{2}$ by 11 table, cross-arms 31 inches and long arms 62 inches. For a 5 by 10 table, the cross-arms of the pendant should measure, from light to light, 28 inches and the long arm 56 inches. For a $4\frac{1}{2}$ by 9 table, cross-arms 25 inches and long arms 50 inches. For a 4 by 8 table, cross-arms 22 inches and long arms 44 inches.

BOWLING ALLEY STANDARD SIZE

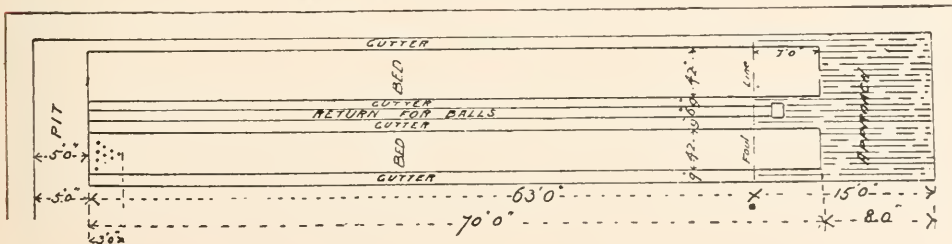
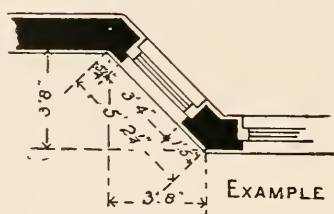


Table Showing the Length of Sides of Bays, Angle being 45 Degrees.



1 ft. 6 in. by 1 ft. 6 in.	2 ft. 1 ¹ / ₈ in.	2 ft. 10 in. by 2 ft. 10 in.	4 ft. 0 ¹ / ₈ in.
1 " 7 " " 1 " 7 "	2 " 2 ⁷ / ₈ "	2 " 11 " " 2 " 11 "	4 " 1 ¹ / ₂ "
1 " 8 " " 1 " 8 "	2 " 4 ¹ / ₄ "	3 " 0 " " 3 " 0 "	4 " 2 ¹ / ₈ "
1 " 9 " " 1 " 9 "	2 " 5 ¹ / ₈ "	3 " 1 " " 3 " 1 "	4 " 4 ¹ / ₈ "
1 " 10 " " 1 " 10 "	2 " 7 ¹ / ₈ "	3 " 2 " " 3 " 2 "	4 " 5 ³ / ₄ "
1 " 11 " " 1 " 11 "	2 " 8 ¹ / ₂ "	3 " 3 " " 3 " 3 "	4 " 7 ¹ / ₈ "
2 " 0 " " 2 " 0 "	2 " 9 ¹ / ₈ "	3 " 4 " " 3 " 4 "	4 " 8 ³ / ₈ "
2 " 1 " " 2 " 1 "	2 " 11 ³ / ₈ "	3 " 5 " " 3 " 5 "	4 " 10 "
2 " 2 " " 2 " 2 "	3 " 0 ³ / ₄ "	3 " 6 " " 3 " 6 "	4 " 11 ³ / ₈ "
2 " 3 " " 2 " 3 "	3 " 2 ¹ / ₈ "	3 " 7 " " 3 " 7 "	4 " 1 ⁵ / ₈ "
2 " 4 " " 2 " 4 "	3 " 3 ⁵ / ₈ "	3 " 8 " " 3 " 8 "	4 " 2 ¹ / ₄ "
2 " 5 " " 2 " 5 "	3 " 5 "	3 " 9 " " 3 " 9 "	4 " 3 ⁵ / ₈ "
2 " 6 " " 2 " 6 "	3 " 6 ⁷ / ₈ "	3 " 10 " " 3 " 10 "	4 " 5 ¹ / ₈ "
2 " 7 " " 2 " 7 "	3 " 7 ⁷ / ₈ "	3 " 11 " " 3 " 11 "	4 " 6 ¹ / ₂ "
2 " 8 " " 2 " 8 "	3 " 9 ¹ / ₄ "	4 " 0 " " 4 " 0 "	4 " 7 ⁷ / ₈ "
2 " 9 " " 2 " 9 "	3 " 10 ¹ / ₈ "		

Results of tests by Prof. Thomas Wilson to ascertain the amount of light passing through or obstructed by glass.

	Percentage of Light.	
	Admitted.	Obstructed.
American Crystal, ground one side	50.00	50.00
Clear Plate.....	87.50	12.50
American Crystal, clear, double thick.....	87.50	12.50
American Crystal, clear, single thick.....	87.50	12.50
Plate, ground one side.....	50.00	50.00
Plate, ground two sides.....	37.50	62.50
American Crystal, ground two sides.	37.50	62.50
Hammered ¹ / ₄ inch thick	87.50	12.50
Ribbed ¹ / ₄ inch thick.....	75.00	25.00

Sizes of Piano.

7 ¹/₈ Octaves.

	Height.	Length.	Width.
Upright.....	about 4 ft. 3 in.	5 ft. 4 in.	2 ft. 3 in.
Small or Baby Grand.....	about 3 ft. 2 in.	6 ft. 0 in.	4 ft. 10 in.
Parlor Grand.....	about 3 ft. 2 in.	7 ft. 6 in.	5 ft. 0 in.

Transmission of Heat by Various Substances.

Window glass being.....	1,000
Oak or Walnut	66
White Pine.....	80
Pitch “	100
Lath and Plaster.....	75 to 100
Brick (rough).....	200 to 250
“ Whitewashed.....	200
Granite or Slate.....	250
Sheet Iron.....	1030 to 1110

Table Showing Amount of Glass Surface which may be Heated by 1 Square Foot of Radiating Surface in Good Buildings.

Temperature of radiating surface (radiators) Fahr.....	Hot Water.			Steam.	
	160°	180°	200°	227° 5 Lbs.	240° 10 Lbs.

Square Feet of Glass to 1 Square Foot Radiator Surface.

Temperature above surrounding air 90°.....	1.9	2.3	2.8	3.3	3.8
“ “ “ “ 80°.....	2.3	2.9	3.5	4.0	4.6
“ “ “ “ 70°.....	3.0	3.6	4.2	5.0	5.7
“ “ “ “ 60°.....	4.0	4.6	5.25	6.0	7.0
“ “ “ “ 50°.....	5.0	6.0	6.8	8.0	9.0
“ “ “ “ 40°.....	6.9	8.0	8.2	10.0	11.5

Proportion of Parts of Steam Heating Boilers.

FROM PROF. R. C. CARPENTER.

Radiating surface=square feet.....	250	500	750	1000	1500	2000	3000	4000	5000	7500	10000
Nominal horse-power.....	2.5	5.0	7.5	10.0	15.0	20.0	30.0	40.0	50.0	75.0	100.0
Ratio radiating to heating surface.....	4.5	5.1	5.4	5.6	6.0	6.2	6.7	6.9	7.0	7.0	7.0
Probable evaporation per lb. coal.....	5.5	5.7	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
Pounds of steam per sq. ft. grate (A)...	55.0	57.0	60.0	65.0	70.0	75.0	80.0	85.0	90.0	95.0	100.0
Pounds of steam per sq. ft. grate (B)...	44.0	46.0	48.0	52.0	56.0	60.0	64.0	68.0	72.0	76.0	80.0
Ratio radiating to grate surface (A)....	165.0	171.0	180.0	195.0	210.0	225.0	240.0	255.0	270.0	285.0	300.0
Ratio radiating to grate surface (B)....	132.0	138.0	144.0	156.0	168.0	180.0	192.0	204.0	216.0	228.0	240.0
Ratio heating to grate surface (A).....	36.5	33.2	33.2	34.8	35.0	36.2	36.5	37.0	38.5	40.5	42.5
Ratio heating to grate surface (B).....	28.5	27.0	26.7	27.7	28.0	29.0	29.3	29.6	30.8	31.5*	33.3*
Heating surface, square feet.....	55.0	98.0	138.0	178.0	250.0	322.0	447.0	580.0	710.0	833*	1111*
Grate surface, square feet (A).....	1.52	2.92	4.15	5.68	7.15	8.9	12.4	15.7	18.5	26.5	33.3
Grate surface, square feet (B).....	1.88	3.88	5.4	6.37	8.92	11.2	15.5	19.5	23.2	32.5	41.5
Diameter of safety valve, inches.....	1.5	2.25	2.50	2.75	3.0	3.25	3.5	4.2	4.0	2 of 3	2 of 4
Diameter of smoke flues, inches.....	7.0	10.0	11.2	12.0	15.0	17.0	19.0	23.0	25.0	28	3A
Square inches in above flues.....	38.5	78.5	95.0	113.0	176.7	227.0	283.5	415.5	490.9	615.7	907.9

* Water tube boilers.

A When rate of coal consumption is 10 pounds per hour each square foot grate surface.

B When rate of coal consumption is 8 pounds per hour each square foot grate surface.

Solders.

	Copper.	Tin.	Lead.	Zinc.	Silver.	Bismuth	Gold.	Cadmium.	Antimony.
Tin		25	75						
Tin		58	16			16			10
Tin, coarse, melts at 500°		33	67						
Tin, ordinary, melts at 360°		67	33						
Spelter, soft	50			50					
Spelter, hard	65			35					
Lead		33	67						
Steel	13			5	82				
Brass or Copper	50			50					
Fine Brass	47			47	6				
Pewterer's, or soft		33	45			22			
Pewterer's, or soft		50	25			25			
Plumber's pot metal		33	67						
" " coarse		25	75						
" " fine		67	33						
" " fusible		50	50						
" " very fusible		25	25			50			
Gold	4				7		89		
Gold, hard	66			34					
Gold, soft		66	34						
Silver, hard	20				80				
Silver, soft	12				67			21	
Pewter		40	20			40			
Iron	66			33					1
Copper	53	47							

Length in Feet of Joists, Scantling and Timber.

Size in Inches	12	14	16	18	20	22	24	26	28	30	42	44	45
2 x 4	8	9	11	12	13	15	16	17	19	20	28	29	30
2 x 6	12	14	16	18	20	22	24	26	28	30	42	44	45
2 x 8	16	19	21	24	27	29	32	35	37	40	53	58	60
2 x 10	20	23	27	30	33	37	40	43	47	50	70	74	75
2 x 12	24	28	32	36	40	44	48	52	56	60	84	88	90
3 x 4	12	14	16	18	20	22	24	26	28	30	42	44	45
3 x 6	18	21	24	27	30	33	36	39	42	45	63	66	68
3 x 8	24	28	32	36	40	44	48	52	56	60	84	88	90
3 x 10	30	35	40	45	50	55	60	65	70	75	105	110	113
3 x 12	36	42	48	54	60	66	72	78	84	90	126	132	135
4 x 4	16	19	21	24	27	29	32	35	37	40	56	58	60
4 x 6	24	28	32	36	40	44	48	52	56	60	84	88	90
4 x 8	32	37	43	48	53	59	64	69	75	80	112	118	120
4 x 10	40	47	53	60	67	73	80	87	93	100	140	146	150
4 x 12	48	56	64	72	80	88	96	104	112	120	168	176	180
6 x 6	36	42	48	54	60	66	72	78	84	90	126	132	135
6 x 8	48	56	64	72	80	88	96	104	112	120	168	176	180
6 x 10	60	70	80	90	100	110	120	130	140	150	210	220	225
6 x 12	72	84	96	108	120	132	144	156	168	180	250	265	270
8 x 8	64	75	85	96	107	117	128	139	149	160	224	234	240
8 x 10	80	93	107	120	133	147	160	173	187	200	280	294	300
8 x 12	96	112	128	144	160	176	192	208	224	240	336	352	360
10 x 10	100	117	133	150	167	183	200	217	233	250	350	366	375
10 x 12	120	140	160	180	200	220	240	260	280	300	420	440	450
12 x 12	144	168	192	216	240	264	288	312	336	360	504	528	540
12 x 14	168	196	224	252	280	308	336	364	392	420	588	616	630
14 x 14	196	220	261	294	327	359	392	425	457	480	686	718	735

Table Showing the Pressure of Water at Different Elevations.

Feet Head	Equals Pressure per Square Inch.	Feet Head	Equals Pressure per Square Inch.	Feet Head	Equals Pressure per Square Inch.	Feet Head	Equals Pressure per Square Inch.	Feet Head	Equals Pressure per Square Inch.	Feet Head	Equals Pressure per Square Inch.
1	43	65	28.15	130	56.31	195	84.47	260	112.62	325	151.61
5	2 16	70	30.32	135	58.48	200	86.63	265	114.79	330	155.94
10	4 33	75	32.43	140	60.64	205	88.80	270	116.95	335	160.27
15	6 49	80	34.65	145	62.81	210	90.96	275	119.12	340	164.61
20	8 66	85	36.82	150	64.97	215	93.14	280	121.29	345	168.94
25	10 82	90	38.98	155	67.14	220	95.30	285	123.45	350	173.27
30	12 99	95	41.15	160	69.31	225	97.49	290	125.62	355	177.60
35	15 16	100	43.31	165	71.47	230	99.63	295	127.78	360	181.93
40	17 32	105	45.48	170	73.64	235	101.79	300	129.95	365	186.26
45	19 49	110	47.64	175	75.80	240	103.96	310	134.28	370	190.59
50	21 65	115	49.81	180	77.97	245	106.13	320	138.62	375	194.92
55	23 82	120	51.98	185	80.14	250	108.29	330	142.95	380	199.25
60	25 99	125	54.15	190	82.30	255	110.46	340	147.28	385	203.58

Wrought-iron Welded Pipe.

DIMENSIONS, WEIGHTS, ETC., OF STANDARD SIZES FOR STEAM, GAS, WATER, OIL, ETC.

Inside Diameter	Outside Diameter	External Circumference, A	Length of Pipe per Sq Foot of Outside Surface.	Internal Area	External Area.	Length of Pipe containing one Cubic Foot.	Weight per Foot of Length	No. of Threads per Inch of Screw.	Contents in *Gallons per Foot.	Weight of Water per Foot of Length.
In.	In.	In.	Ft.	In.	In.	Ft	Lbs.			Lbs.
1	40	1 272	9.44	012	129	2,500	.24	27	.0006	.005
1 1/4	.54	1 636	7.075	049	229	1,385.	.42	18	.0026	.021
1 1/2	67	2 121	5.657	110	358	751.5	.56	14	.0057	.047
1 3/4	84	2 652	4.502	196	554	472.4	.84	14	.0102	.085
2	1 05	3 299	3 637	441	866	270.	1.12	11 1/2	.0230	.190
2 1/4	1 31	4 134	2.903	785	1,357	166.9	1 67	11 1/2	.0408	.349
2 1/2	1 66	5 215	2.301	1 227	2 164	96.25	2.25	11 1/2	.0638	.527
3	1 9	5.969	2.01	1,767	2 835	70.65	2.69	11 1/2	.0918	.760
3 1/2	2 237	7.461	1 611	3,141	4,330	42.36	3.66	8	.1632	1.356
4	2 87	9 032	1 328	4,908	6,491	30.11	5.77	8	.2550	2.116
4 1/2	3 5	10 996	1.091	7,068	9,621	19.49	7.54	8	.3673	3 049
5	4	12,566	.955	9 621	12 566	14.56	9 05	8	.4998	4 155
5 1/2	4 5	14 137	.849	12,566	15,904	11.31	10.72	8	.6528	5.405
6	5.	15 708	.765	15,904	19 635	9 03	12.49	8	.8263	6.851
6 1/2	5 56	17 475	.629	19 635	24,299	7.20	14.56	8	1.020	8,500
7	6 62	20 813	.577	28 274	34,471	4 95	15 76	8	1 469	12,312
7 1/2	7 62	23 934	.505	38 484	45,663	3.72	23 41	5	1.999	16,662
8	8 62	27,006	.444	50,265	58,426	2.85	28 34	5	2 611	21,750
9	9 68	30 433	.394	63 617	73,715	2 26	34 67	5	3 300	27 500
10	10 75	33 772	.355	78,540	90,792	1 80	40 64	5	4 081	34 000

* The Standard U. S. gallon of 231 inches.

Multiply the external circumference column, A, by 12 and the result will be the square feet of surface per lineal foot

Quantity of Brickwork in Barrel Drains and Wells.

Diameter in Clear	Thickness of Brickwork	Superficial Feet of Brickwork in One Lineal Yard.	Number of Bricks Required for One Lineal Yard
1 foot, 0 inches	0 feet, 4 1/2 inches	16 feet, 6 inches	115
1 " 6 "	0 " 4 1/2 "	21 " 2 "	148
2 " 0 "	0 " 4 1/2 "	25 " 10 "	181
2 " 0 "	0 " 9 "	33 " 0 "	462
2 " 6 "	0 " 9 "	37 " 8 "	528
2 " 6 "	1 " 1 "	43 " 2 "	906
3 " 0 "	0 " 9 "	42 " 6 "	594
3 " 0 "	1 " 1 "	47 " 10 "	1004
3 " 6 "	0 " 9 "	47 " 1 "	659
3 " 6 "	1 " 1 "	52 " 7 "	1104
4 " 0 "	0 " 9 "	51 " 10 "	725
4 " 0 "	1 " 1 "	57 " 3 "	1203
5 " 0 "	0 " 9 "	61 " 3 "	857
5 " 0 "	1 " 1 "	66 " 9 "	1402
6 " 0 "	1 " 1 "	76 " 1 "	1597
7 " 0 "	1 " 1 "	85 " 6 "	1795

TABLE OF TREADS AND RISES.

No. of Treads.	G	G ₁	G ₁ ¹	G ₁ ²	G ₁ ³	G ₁ ⁴	G ₁ ⁵	G ₁ ⁶	G ₁ ⁷	G ₁ ⁸	G ₁ ⁹	G ₁ ¹⁰	G ₁ ¹¹	G ₁ ¹²	G ₁ ¹³	G ₁ ¹⁴
1	6	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂
2	1 0	1 0 ¹ / ₂	1 1 ¹ / ₂	1 1 ¹ / ₂	1 1 ¹ / ₂	1 1 ¹ / ₂	1 1 ¹ / ₂	1 1 ¹ / ₂	1 1 ¹ / ₂	1 1 ¹ / ₂	1 1 ¹ / ₂	1 1 ¹ / ₂	1 1 ¹ / ₂	1 1 ¹ / ₂	1 1 ¹ / ₂	1 1 ¹ / ₂
3	1 6	1 6 ¹ / ₂	1 7 ¹ / ₂	1 8 ¹ / ₂	1 9 ¹ / ₂	1 9 ¹ / ₂	1 9 ¹ / ₂	1 9 ¹ / ₂	1 9 ¹ / ₂	1 9 ¹ / ₂	1 9 ¹ / ₂	1 9 ¹ / ₂	1 9 ¹ / ₂	1 9 ¹ / ₂	1 9 ¹ / ₂	1 9 ¹ / ₂
4	2 0	2 1	2 2	2 3	2 4	2 4 ¹ / ₂	2 5	2 5 ¹ / ₂	2 6	2 6 ¹ / ₂	2 7	2 7 ¹ / ₂	2 8	2 8 ¹ / ₂	2 9	2 9 ¹ / ₂
5	2 6	2 7 ¹ / ₂	2 8 ¹ / ₂	2 9 ¹ / ₂	2 10 ¹ / ₂	2 11 ¹ / ₂	2 12	2 12 ¹ / ₂	2 13	2 13 ¹ / ₂	2 14	2 14 ¹ / ₂	2 15	2 15 ¹ / ₂	2 16	2 16 ¹ / ₂
6	3 0	3 1 ¹ / ₂	3 3	3 4 ¹ / ₂	3 6	3 6 ¹ / ₂	3 7 ¹ / ₂	3 8 ¹ / ₂	3 9	3 9 ¹ / ₂	3 10	3 10 ¹ / ₂	3 11	3 11 ¹ / ₂	3 12	3 12 ¹ / ₂
7	3 6	3 7 ¹ / ₂	3 9 ¹ / ₂	3 11 ¹ / ₂	4 1	4 1 ¹ / ₂	4 2 ¹ / ₂	4 3 ¹ / ₂	4 4	4 4 ¹ / ₂	4 5	4 5 ¹ / ₂	4 6	4 6 ¹ / ₂	4 7	4 7 ¹ / ₂
8	4 0	4 2	4 4	4 6	4 8	4 9	4 10	4 11	5 0	5 1	5 2	5 3	5 4	5 5	5 6	5 7
9	4 6	4 8 ¹ / ₂	4 10 ¹ / ₂	5 0 ¹ / ₂	5 3	5 4 ¹ / ₂	5 5 ¹ / ₂	5 6 ¹ / ₂	5 7 ¹ / ₂	5 8 ¹ / ₂	5 9 ¹ / ₂	6 0	6 1	6 2	6 3	6 4
10	5 0	5 2 ¹ / ₂	5 5	5 7 ¹ / ₂	5 10	5 11 ¹ / ₂	6 0 ¹ / ₂	6 1 ¹ / ₂	6 3	6 4 ¹ / ₂	6 5 ¹ / ₂	6 6	6 7	6 8	6 9	7 0
11	5 6	5 8 ¹ / ₂	5 11 ¹ / ₂	6 2 ¹ / ₂	6 5	6 6 ¹ / ₂	6 7 ¹ / ₂	6 8 ¹ / ₂	6 9	6 10 ¹ / ₂	6 11 ¹ / ₂	6 12	6 13	6 14	6 15	6 16
12	6 0	6 3	6 6	6 9	7 0	7 1 ¹ / ₂	7 3	7 4 ¹ / ₂	7 6	7 7 ¹ / ₂	7 9	7 10 ¹ / ₂	7 11	7 12	7 13	7 14
13	6 6	6 9 ¹ / ₂	7 0 ¹ / ₂	7 3 ¹ / ₂	7 7	7 8 ¹ / ₂	7 10 ¹ / ₂	7 11 ¹ / ₂	8 1	8 2 ¹ / ₂	8 4	8 5 ¹ / ₂	8 6	8 7	8 8	8 9
14	7 0	7 3 ¹ / ₂	7 7	7 10 ¹ / ₂	8 2	8 3 ¹ / ₂	8 5 ¹ / ₂	8 7 ¹ / ₂	8 9	8 10 ¹ / ₂	9 0	9 1	9 2	9 3	9 4	9 5
15	7 6	7 9 ¹ / ₂	8 1 ¹ / ₂	8 5 ¹ / ₂	8 9	8 10 ¹ / ₂	9 0 ¹ / ₂	9 2 ¹ / ₂	9 4 ¹ / ₂	9 5 ¹ / ₂	9 6 ¹ / ₂	9 7 ¹ / ₂	9 8	9 9	10 0	10 1
16	8 0	8 4	8 8	9 0	9 4	9 6	9 8	9 10	10 0	10 2	10 4	10 6	10 8	10 10	10 12	10 14
17	8 6	8 10 ¹ / ₂	9 2 ¹ / ₂	9 6 ¹ / ₂	9 11	10 1 ¹ / ₂	10 3 ¹ / ₂	10 5 ¹ / ₂	10 7 ¹ / ₂	10 9 ¹ / ₂	10 11 ¹ / ₂	10 13 ¹ / ₂	10 15 ¹ / ₂	10 17 ¹ / ₂	10 19 ¹ / ₂	10 21 ¹ / ₂
18	9 0	9 4 ¹ / ₂	9 9	10 1 ¹ / ₂	10 6	10 8 ¹ / ₂	10 10 ¹ / ₂	10 12 ¹ / ₂	11 0	11 2	11 4	11 6	11 8	11 10	11 12	11 14
19	9 6	9 10 ¹ / ₂	10 3 ¹ / ₂	10 8 ¹ / ₂	11 1	11 3 ¹ / ₂	11 5 ¹ / ₂	11 7 ¹ / ₂	11 9 ¹ / ₂	11 11 ¹ / ₂	11 13 ¹ / ₂	11 15 ¹ / ₂	11 17 ¹ / ₂	11 19 ¹ / ₂	11 21 ¹ / ₂	11 23 ¹ / ₂
20	10 0	10 5	10 10	11 3	11 8	11 10 ¹ / ₂	12 1	12 3 ¹ / ₂	12 6	12 8 ¹ / ₂	12 11	12 13 ¹ / ₂	12 16	12 18 ¹ / ₂	12 21	12 24
21	10 6	10 11 ¹ / ₂	11 4 ¹ / ₂	11 9 ¹ / ₂	12 3	12 5 ¹ / ₂	12 8 ¹ / ₂	12 10 ¹ / ₂	12 13	12 16 ¹ / ₂	12 19 ¹ / ₂	12 22 ¹ / ₂	12 25 ¹ / ₂	12 28 ¹ / ₂	12 31	12 34
22	11 0	11 5 ¹ / ₂	11 11	12 4 ¹ / ₂	12 10	12 13 ¹ / ₂	13 0 ¹ / ₂	13 3 ¹ / ₂	13 6	13 9 ¹ / ₂	13 12 ¹ / ₂	13 15 ¹ / ₂	13 18 ¹ / ₂	13 21 ¹ / ₂	13 24 ¹ / ₂	13 27
23	11 6	11 11 ¹ / ₂	12 5 ¹ / ₂	12 11 ¹ / ₂	13 5	13 7 ¹ / ₂	13 10 ¹ / ₂	13 13 ¹ / ₂	14 0	14 3 ¹ / ₂	14 6 ¹ / ₂	14 9 ¹ / ₂	14 12 ¹ / ₂	14 15 ¹ / ₂	14 18 ¹ / ₂	14 21
24	12 0	12 6	13 0	13 6	14 0	14 3	14 6	14 9	15 0	15 3	15 6	15 9	16 0	16 3	16 6	16 9
25	12 6	13 0 ¹ / ₂	13 6 ¹ / ₂	14 0 ¹ / ₂	14 7	14 10 ¹ / ₂	15 1 ¹ / ₂	15 4 ¹ / ₂	15 7 ¹ / ₂	15 10 ¹ / ₂	16 1 ¹ / ₂	16 4 ¹ / ₂	16 7 ¹ / ₂	16 10 ¹ / ₂	16 13 ¹ / ₂	16 16
26	13 0	13 6 ¹ / ₂	14 1	14 7 ¹ / ₂	15 2	15 6 ¹ / ₂	15 11 ¹ / ₂	16 0 ¹ / ₂	16 3 ¹ / ₂	16 6 ¹ / ₂	16 9 ¹ / ₂	16 12 ¹ / ₂	16 15 ¹ / ₂	16 18 ¹ / ₂	16 21 ¹ / ₂	16 24
27	13 6	14 0 ¹ / ₂	14 7 ¹ / ₂	15 2 ¹ / ₂	15 9	16 0 ¹ / ₂	16 3 ¹ / ₂	16 6 ¹ / ₂	16 9 ¹ / ₂	16 12 ¹ / ₂	16 15 ¹ / ₂	16 18 ¹ / ₂	16 21 ¹ / ₂	16 24 ¹ / ₂	16 27 ¹ / ₂	16 30
28	14 0	14 7	15 2	15 9	16 4	16 7 ¹ / ₂	16 11	17 2 ¹ / ₂	17 6	17 9 ¹ / ₂	18 1	18 4 ¹ / ₂	18 8	19 0 ¹ / ₂	19 3 ¹ / ₂	19 6
29	14 6	15 1 ¹ / ₂	15 8 ¹ / ₂	16 3 ¹ / ₂	16 11	17 2 ¹ / ₂	17 6 ¹ / ₂	17 9 ¹ / ₂	18 1 ¹ / ₂	18 5 ¹ / ₂	18 8 ¹ / ₂	19 0 ¹ / ₂	19 3 ¹ / ₂	19 6 ¹ / ₂	19 9 ¹ / ₂	19 12
30	15 0	15 7 ¹ / ₂	16 3	16 10 ¹ / ₂	17 6	17 9 ¹ / ₂	18 1 ¹ / ₂	18 5 ¹ / ₂	18 9	19 0 ¹ / ₂	19 3 ¹ / ₂	19 6 ¹ / ₂	19 9 ¹ / ₂	19 12 ¹ / ₂	19 15 ¹ / ₂	19 18

Some of the Physical Properties of Metals—Compiled from the Best Authorities.

Common Name.	Chemical Name.	Initial.	Atomic Weight.	Specific Gravity.	Weight Cubic Inch.	Weight Cubic Foot.	Melting Point F.	Specific Heat.	Conductivity of Heat.	Conductivity of Electricity.	Expansion $\frac{1}{212^{\circ} \text{ F.}}$	Hardness, the Diamond,—3010.	Density.	Ductility, Gold being 1.	Malleability, Gold being 1.	Approximate price per lb. avoirdupois.
Hydrogen	Same.....	H.	1.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	\$ 16.30
Aluminum	Same.....	Al.	27.3	2.55	.0924	159,005	1160	.214	31.33	.....	.....	821	.....	.....	.....	0.36
Antimony	Stibium	Sb.	122.0	6.71	.212	418,402	812	.0508	4.03	4.6	.....	.....	.....	.....	.....	1.95
Bismuth	Same.....	Bi.	207.5	9.823	.354	612,513	510	.0308	1.8	1.1	.001	.....	10.035	.....	.....	3.26
Cadmium	Same.....	Cd.	111.6	8.60	.31	536,253	500	.0567	20.06	.....	.0094	760	8.217	.....	.....	0.22
Copper	Cuprum	Cu.	63.3	8.82	.318	519,971	1930	.093	74.8	94.1	.0051	1360	.....	6	3	299.72
Gold	Aurum	Au.	196.2	19.32	.697	1224,699	1915	.0324	51.8	73.0	.....	979	.....	1	1	466.59
Indium	Same.....	Ir.	196.7	22.42	.809	1392,999	4500	.0326	.....	.....	.....	984	.....	.....	.....	0.015
Iron	Ferrum	Fe.	55.9	7.8	.281	486,369	3060	.1138	10.1	15.5	.0035	1375	.....	4	8	0.06
Lead	Plumbum.....	Pb.	206.4	11.37	.110	708,976	625	.0314	7.9	7.6	.0084	570	10.370	9	6	45.30
Magnesium	Same.....	Mg.	23.94	1.74	.628	89,791	1200	.25	31.3	.....	.0083	726	.....	.....	.....	108.72
Manganese....	Same.....	Mn.	58.8	8.0	.289	498.84	3420	.122	.....	.....	.....	1456	.....	.....	.....	1.40
Mercury.....	Hydrargyrum.	Hg.	199.8	13.58	.490	846,781	39	.0317	1.3	.....	.0182	0	.....	.....	.....	5.80
Nickel.....	Same.....	Ni.	58.6	8.80	.318	551,842	3000	.109	.....	13.1	.0038	1410	.....	5	9	122.31
Platinum	Same.....	Pt.	196.7	21.50	.777	155,887	3200	.0321	9.4	16.6	.0027	1107	.....	3	5	22.65
Potassium	Kalium	K.	39.04	.875	.0316	54,561	110	.166	.....	.....	.....	230	.....	.....	.....	18.60
Silver	Argentum	Ag.	107.66	10.53	.38	656,598	1750	.056	100.00	100.0	.0056	990	.....	2	2	3.26
Sodium.....	Natrium	Na.	23.0	.9735	.035	60,503	170	.293	36.5	.....	.....	400	.....	.....	.....	0.025
Steel .....	.....	.....	.....	7.854	.283	489,736	2550	.1165	11.6	12.0	.....	.....	.....	.....	.....	.....
Tin	Stannum	Sn.	117.8	7.293	.263	451,751	440	.055	15.4	11.4	.0069	651	7.025	8	4	0.25
Zinc	Same.....	Zn.	64.9	7.14	.258	441,215	780	.0996	36.0	29.0	.0088	1077	6.180	7	7	0.10

LAW OF SPECIFIC HEAT.—In order to raise the temperature of different bodies the same number of thermometric degrees very different amounts of heat are required. The atoms of the solid element possess sensibly the same specific heat.

DUCTILITY.—The property of being drawn into wire or threads.

MALLEABILITY.—The capacity of being extended in all directions by beating with the hammer.

Table of greatest center loads for horizontal rectangular beams of white or yellow pine, or of spruce, 1 inch broad, supported at both ends, and required not to bend more than $\frac{1}{40}$ inch per foot of clear span, or $\frac{1}{100}$ part of the entire clear span. In practice, to allow for knots, &c, take only $\frac{2}{3}$ rds. of clear span, with a constant .000375. Instead of .00032.

The loads in this table include the weight of the clear beam itself: .625 of which (or % of which) must be deducted from the tabular loads to get the net load, when the beam is loaded at its center. When uniformly loaded, the loads will be 1.6 times as great as those in this table; but in that case the weight of the entire clear beam must be deducted. In practice this deduction need rarely be made.

CLEAR SPANS IN FEET. (TRAUTWINE)																		Depth in Ins.	Wt. of 10 ft. Lgth of Beam.
3	4	5	6	7	8	9	10	12	14	16	18	20	25	30	35	40			
1	lbs. 8.4	lbs. 4.8	lbs. 3.0	lbs. 2.1	lbs. 5.3	lbs. 9.6	lbs. 14	lbs. 21	lbs. 33	lbs. 48	lbs. 66	lbs. 96	lbs. 138	lbs. 204	lbs. 288	lbs. 396	lbs. 528	1 ½	
2	28.7	16.2	10.4	7.2	12.4	19.6	27.1	34.6	42.1	49.6	57.1	64.6	72.1	79.6	87.1	94.6	102.1	2 ½	
3	68.4	38.4	24.4	17.1	24.4	32.1	39.6	47.1	54.6	62.1	69.6	77.1	84.6	92.1	99.6	107.1	114.6	3 ½	
4	130	75	48	33	48	63	78	93	108	123	138	153	168	183	198	213	228	4 ½	
5	196	130	83	58	83	108	133	158	183	208	233	258	283	308	333	358	383	5 ½	
6	267	196	130	92	117	142	167	192	217	242	267	292	317	342	367	392	417	6 ½	
7	336	267	196	130	166	196	226	256	286	316	346	376	406	436	466	496	526	7 ½	
8	412	336	267	196	226	256	286	316	346	376	406	436	466	496	526	556	586	8 ½	
9	511	412	336	267	297	327	357	387	417	447	477	507	537	567	597	627	657	9 ½	
10	632	511	412	336	366	396	426	456	486	516	546	576	606	636	666	696	726	10 ½	
11	769	632	511	412	442	472	502	532	562	592	622	652	682	712	742	772	802	11 ½	
12	921	769	632	511	541	571	601	631	661	691	721	751	781	811	841	871	901	12 ½	
13	1088	921	769	632	662	692	722	752	782	812	842	872	902	932	962	992	1022	13 ½	
14	1271	1088	921	769	799	829	859	889	919	949	979	1009	1039	1069	1099	1129	1159	14 ½	
15	1471	1271	1088	921	951	981	1011	1041	1071	1101	1131	1161	1191	1221	1251	1281	1311	15 ½	
16	1688	1471	1271	1088	1118	1148	1178	1208	1238	1268	1298	1328	1358	1388	1418	1448	1478	16 ½	
17	1921	1688	1471	1271	1301	1331	1361	1391	1421	1451	1481	1511	1541	1571	1601	1631	1661	17 ½	
18	2181	1921	1688	1471	1501	1531	1561	1591	1621	1651	1681	1711	1741	1771	1801	1831	1861	18 ½	
20	2671	2181	1921	1688	1718	1748	1778	1808	1838	1868	1898	1928	1958	1988	2018	2048	2078	20 ½	
22	3181	2671	2181	1921	1951	1981	2011	2041	2071	2101	2131	2161	2191	2221	2251	2281	2311	22 ½	
24	3721	3181	2671	2181	2211	2241	2271	2301	2331	2361	2391	2421	2451	2481	2511	2541	2571	24 ½	
26	4291	3721	3181	2671	2701	2731	2761	2791	2821	2851	2881	2911	2941	2971	3001	3031	3061	26 ½	
28	4891	4291	3721	3181	3211	3241	3271	3301	3331	3361	3391	3421	3451	3481	3511	3541	3571	28 ½	
30	5521	4891	4291	3721	3751	3781	3811	3841	3871	3901	3931	3961	3991	4021	4051	4081	4111	30 ½	
On this side of the dark lines, the safe loads of table. --- would not bend the wooden beams as																			
Iron and Steel.																			
such as 1 of their clear span.																			
Average cast iron, with the same safe def will bear about 11½ as much as common yellow or white																			
pine, or spruce; and wrought iron 19 times as much. The same proportion of the weight of the beam																			
itself must, however, be deducted as stated above for wood. Average steel 29 times as much as pine.																			

On this side of the dark lines, the safe loads of table. — would not bend the wooden beams as much as $\frac{1}{40}$ of their clear span.
 Average cast iron, with the same safe def will bear about $11\frac{1}{2}$ as much as common yellow or white pine, or spruce; and wrought iron 19 times as much. The same proportion of the weight of the beam itself must, however, be deducted as stated above for wood. Average steel 29 times as much as pine.

Corrosion of Steel and Iron

C=Coefficient of Corrosion during 1 year's exposure in pounds avoirdupois per square foot.
(For value of C see table.)

W=Weight in pounds of 1 foot in length of section exposed.

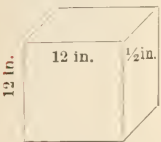
L=Length in feet of the perimeter exposed. If both the inside and outside perimeter are exposed to the Corrosive influence both must be included.

Y|| The number of years of life of the metal.

$$\text{Formula } Y = \frac{W}{C L}$$

Table of Value of C.

	Corroding Agents.					
	Foul Sea Water.	Clear Sea Water.	Foul River Water.	Pure Air or Clear River Water.	Air of City Manufacturing District or Sea Water.	Sea Water of Average Foulness.
Cast Iron.....	.0656	.0635	.0381	.0113	.0476	.....
Wrought Iron.....	.1956	.1285	.1440	.0123	.1254	.....
Steel.....	.1914	.0970	.1133	.0125	.1252	.....
Cast Iron, planed.....	.2301	.0888	.0728	.0109	.0884	.....
" " galvanized.....	.0895	.0359	.0371	.0371	.0199	.....
" " in contact with brass.....	.....	.....	.....	.....	.....	.1908
" " " " copper.....	.....	.....	.....	.....	.....	.2003
" " " " gun metal.....	.....	.....	.....	.....	.....	.3493
Best Wrought Iron in contact with brass.....	.....	.....	.....	.....	.....	.2779
" " " " copper.....	.....	.....	.....	.....	.....	.4012
" " " " gun metal.....	.....	.....	.....	.....	.....	.4537



Example=Steel.

$$W=12\text{-in.} \times 12\text{-in.} \times \frac{1}{2}\text{-in.} \times .283=20.376 \text{ pounds.}$$

$$L=1 \text{ ft. } 0\text{-in.}$$

$$C=.1252 \text{ from table.}$$

$$Y = \frac{W}{C L} = \frac{20.376}{.1252 \times 1} = \frac{20.376}{.1252} = 162.667 \text{ years.}$$

The corrosion of steel unprotected in manufacturing districts of cities would therefore amount to 20.38 pounds in 162.67 years of the above dimensions of block of steel, or in that time it would be entirely consumed by oxidization.

NAILS REQUIRED FOR DIFFERENT KINDS OF WORK.

For 1,000 shingles, 3½ to 5 lbs. 4d. nails, or 3 to 3½ lbs. 3d.

For 1,000 laths, about 7 lbs. 3d. fine.

For 1,000 feet clapboards, about 18 lbs. 6d. box.

For 1,000 feet covering boards, about 20 lbs. 8d. common. or 25 lbs. 10d.

For 1,000 feet upper floors, square edged, about 38 lbs. 10d. floor, or 41 lbs. 12d. floor.

For 1,000 feet upper floors, matched and blind-nailed, 38 lbs. 10d., or 42 lbs. 12d. common.

For 10 feet partitions, studs or studding, 1 lb. 10d. common.

For 1,000 feet furring, 1x3, about 45 lbs. 10d. common.

For 1,000 feet furring, 1x2, about 65 lbs. 10d. common.

For 1,000 feet pine finish, about 30 lbs. 8d. finish.

For roofs and gutters use seven-pound lead; for hips and ridges, six-pound; for flashings, four-pound.

Gutters should have a fall of at least one inch in ten feet.

No sheet lead should be laid in greater length than ten or twelve feet without a dip to allow for expansion.

Joints to lead pipes require a pound of solder for every inch in diameter.

TABLES OF SAFE LOADS FOR RECTANGULAR AND CYLINDRICAL COLUMNS.

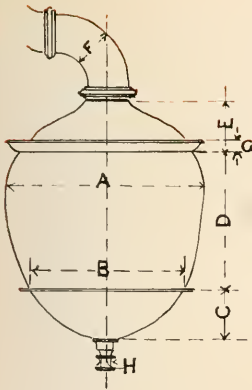
Safe Loads in Tons of 2,000 Lbs. for Hollow Rectangular Cast Iron Columns.

Length in Feet	6 X 8 INCHES.												6 X 10 INCHES.												6 X 12 INCHES.												8 X 10 INCHES.												8 X 12 INCHES.												Length in Feet
	Thickness of Metal in Inches.												Thickness of Metal in Inches.												Thickness of Metal in Inches.												Thickness of Metal in Inches.												Thickness of Metal in Inches.												
	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2	1 3/4	2	2 1/4	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2	1 3/4	2	2 1/4	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2	1 3/4	2	2 1/4																									
7	71.2	80.0	87.0	93.0	98.0	103.0	107.0	111.0	115.0	119.0	123.0	127.0	107.5	122.0	132.0	142.0	152.0	162.0	172.0	182.0	192.0	202.0	212.0	222.0	107.5	122.0	132.0	142.0	152.0	162.0	172.0	182.0	192.0	202.0	212.0	222.0	7																								
8	68.6	77.2	84.0	90.0	95.0	100.0	104.0	108.0	112.0	116.0	120.0	124.0	104.5	119.0	129.0	139.0	149.0	159.0	169.0	179.0	189.0	199.0	209.0	219.0	104.5	119.0	129.0	139.0	149.0	159.0	169.0	179.0	189.0	199.0	209.0	219.0	229.0	8																							
9	66.0	74.6	81.4	87.4	92.4	97.4	101.4	105.4	109.4	113.4	117.4	121.4	102.0	116.5	126.5	136.5	146.5	156.5	166.5	176.5	186.5	196.5	206.5	216.5	102.0	116.5	126.5	136.5	146.5	156.5	166.5	176.5	186.5	196.5	206.5	216.5	226.5	9																							
10	63.4	72.0	78.8	84.8	89.8	94.8	98.8	102.8	106.8	110.8	114.8	118.8	99.0	113.5	123.5	133.5	143.5	153.5	163.5	173.5	183.5	193.5	203.5	213.5	99.0	113.5	123.5	133.5	143.5	153.5	163.5	173.5	183.5	193.5	203.5	213.5	223.5	10																							
11	60.2	68.8	75.6	81.6	86.6	91.6	95.6	99.6	103.6	107.6	111.6	115.6	95.8	110.3	120.3	130.3	140.3	150.3	160.3	170.3	180.3	190.3	200.3	210.3	95.8	110.3	120.3	130.3	140.3	150.3	160.3	170.3	180.3	190.3	200.3	210.3	220.3	11																							
12	57.0	65.6	72.4	78.4	83.4	88.4	92.4	96.4	100.4	104.4	108.4	112.4	92.6	107.1	117.1	127.1	137.1	147.1	157.1	167.1	177.1	187.1	197.1	207.1	92.6	107.1	117.1	127.1	137.1	147.1	157.1	167.1	177.1	187.1	197.1	207.1	217.1	12																							
13	53.8	62.4	69.2	75.2	80.2	85.2	89.2	93.2	97.2	101.2	105.2	109.2	89.4	103.9	113.9	123.9	133.9	143.9	153.9	163.9	173.9	183.9	193.9	203.9	89.4	103.9	113.9	123.9	133.9	143.9	153.9	163.9	173.9	183.9	193.9	203.9	213.9	13																							
14	50.6	59.2	66.0	72.0	77.0	82.0	86.0	90.0	94.0	98.0	102.0	106.0	86.2	100.7	110.7	120.7	130.7	140.7	150.7	160.7	170.7	180.7	190.7	200.7	86.2	100.7	110.7	120.7	130.7	140.7	150.7	160.7	170.7	180.7	190.7	200.7	210.7	14																							
15	47.4	56.0	62.8	68.8	73.8	78.8	82.8	86.8	90.8	94.8	98.8	102.8	83.0	97.5	107.5	117.5	127.5	137.5	147.5	157.5	167.5	177.5	187.5	197.5	83.0	97.5	107.5	117.5	127.5	137.5	147.5	157.5	167.5	177.5	187.5	197.5	207.5	15																							
16	44.2	52.8	59.6	65.6	70.6	75.6	79.6	83.6	87.6	91.6	95.6	99.6	79.8	94.3	104.3	114.3	124.3	134.3	144.3	154.3	164.3	174.3	184.3	194.3	79.8	94.3	104.3	114.3	124.3	134.3	144.3	154.3	164.3	174.3	184.3	194.3	204.3	16																							
17	41.0	49.6	56.4	62.4	67.4	72.4	76.4	80.4	84.4	88.4	92.4	96.4	76.6	91.1	101.1	111.1	121.1	131.1	141.1	151.1	161.1	171.1	181.1	191.1	76.6	91.1	101.1	111.1	121.1	131.1	141.1	151.1	161.1	171.1	181.1	191.1	201.1	17																							
18	37.8	46.4	53.2	59.2	64.2	69.2	73.2	77.2	81.2	85.2	89.2	93.2	73.4	87.9	97.9	107.9	117.9	127.9	137.9	147.9	157.9	167.9	177.9	187.9	73.4	87.9	97.9	107.9	117.9	127.9	137.9	147.9	157.9	167.9	177.9	187.9	197.9	18																							
19	34.6	43.2	50.0	56.0	61.0	66.0	70.0	74.0	78.0	82.0	86.0	90.0	70.2	84.7	94.7	104.7	114.7	124.7	134.7	144.7	154.7	164.7	174.7	184.7	70.2	84.7	94.7	104.7	114.7	124.7	134.7	144.7	154.7	164.7	174.7	184.7	194.7	19																							
20	31.4	40.0	46.8	52.8	57.8	62.8	66.8	70.8	74.8	78.8	82.8	86.8	67.0	81.5	91.5	101.5	111.5	121.5	131.5	141.5	151.5	161.5	171.5	181.5	67.0	81.5	91.5	101.5	111.5	121.5	131.5	141.5	151.5	161.5	171.5	181.5	191.5	20																							

Length in Feet	8 X 14 INCHES.												8 X 16 INCHES.												10 X 12 INCHES.												10 X 14 INCHES.												Length in Feet	
	Thickness of Metal in Inches.												Thickness of Metal in Inches.												Thickness of Metal in Inches.												Thickness of Metal in Inches.													
	N	S	1	1½	1¾	2	2½	3	3½	4	4½	5	N	S	1	1½	1¾	2	2½	3	3½	4	4½	5	N	S	1	1½	1¾	2	2½	3	3½	4	4½	5	N	S	1	1½	1¾	2	2½	3	3½	4	4½	5		
7	134	154	174	192	210	224	235	243	249	254	258	262	182	202	222	242	262	282	302	322	342	362	382	402	182	202	222	242	262	282	302	322	342	362	382	402	182	202	222	242	262	282	302	322	342	362	382	402	7	
8	126	146	166	184	202	216	227	235	241	246	251	255	174	194	214	234	254	274	294	314	334	354	374	394	174	194	214	234	254	274	294	314	334	354	374	394	174	194	214	234	254	274	294	314	334	354	374	394	414	8
9	118	138	158	176	194	208	219	227	233	238	243	247	166	186	206	226	246	266	286	306	326	346	366	386	166	186	206	226	246	266	286	306	326	346	366	386	166	186	206	226	246	266	286	306	326	346	366	386	406	9
10	110	130	150	168	186	200	211	219	225	230	235	239	158	178	198	218	238	258	278	298	318	338	358	378	158	178	198	218	238	258	278	298	318	338	358	378	158	178	198	218	238	258	278	298	318	338	358	378	398	10
11	102	122	142	160	178	192	203	211	217	222	227	231	150	170	190	210	230	250	270	290	310	330	350	370	150	170	190	210	230	250	270	290	310	330	350	370	150	170	190	210	230	250	270	290	310	330	350	370	390	11
12	94	114	134	152	170	184	195	203	209	214	219	223	142	162	182	202	222	242	262	282	302	322	342	362	142	162	182	202	222	242	262	282	302	322	342	362	142	162	182	202	222	242	262	282	302	322	342	362	382	12
13	86	106	126	144	162	176	187	195	201	206	211	215	134	154	174	194	214	234	254	274	294	314	334	354	134	154	174	194	214	234	254	274	294	314	334	354	134	154	174	194	214	234	254	274	294	314	334	354	374	13
14	78	98	118	136	154	168	179	187	193	198	203	207	126	146	166	186	206	226	246	266	286	306	326	346	126	146	166	186	206	226	246	266	286	306	326	346	126	146	166	186	206	226	246	266	286	306	326	346	366	14
15	70	90	110	128	146	160	171	179	185	190	195	199	118	138	158	178	198	218	238	258	278	298	318	338	118	138	158	178	198	218	238	258	278	298	318	338	118	138	158	178	198	218	238	258	278	298	318	338	358	15
16	61	81	101	119	137	151	162	170	176	181	186	190	110	130	150	170	190	210	230	250	270	290	310	330	110	130	150	170	190	210	230	250	270	290	310	330	110	130	150	170	190	210	230	250	270	290	310	330	350	16
17	52	72	92	110	128	142	153	161	167	172	177	181	102	122	142	162	182	202	222	242	262	282	302	322	102	122	142	162	182	202	222	242	262	282	302	322	102	122	142	162	182	202	222	242	262	282	302	322	342	17
18	43	63	83	101	119	133	144	152	158	163	168	172	94	114	134	154	174	194	214	234	254	274	294	314	94	114	134	154	174	194	214	234	254	274	294	314	94	114	134	154	174	194	214	234	254	274	294	314	334	18
19	34	54	74	92	110	124	135	143	149	154	159	163	86	106	126	146	166	186	206	226	246	266	286	306	86	106	126	146	166	186	206	226	246	266	286	306	86	106	126	146	166	186	206	226	246	266	286	306	326	19
20	25	45	65	83	101	115	126	134	140	145	150	154	78	98	118	138	158	178	198	218	238	258	278	298	78	98	118	138	158	178	198	218	238	258	278	298	78	98	118	138	158	178	198	218	238	258	278	298	318	20
21	16	36	56	74	92	106	117	125	131	136	141	145	70	90	110	130	150	170	190	210	230	250	270	290	70	90	110	130	150	170	190	210	230	250	270	290	70	90	110	130	150	170	190	210	230	250	270	290	310	21
22	8	26	46	64	82	96	107	115	121	126	131	135	62	82	102	122	142	162	182	202	222	242	262	282	62	82	102	122	142	162	182	202	222	242	262	282	62	82	102	122	142	162	182	202	222	242	262	282	302	22
23	0	18	38	56	74	88	99	107	113	118	123	127	54	74	94	114	134	154	174	194	214	234	254	274	54	74	94	114	134	154	174	194	214	234	254	274	54	74	94	114	134	154	174	194	214	234	254	274	294	23
24	0	10	30	48	66	80	91	99	105	110	115	119	46	66	86	106	126	146	166	186	206	226	246	266	46	66	86	106	126	146	166	186	206	226	246	266	46	66	86	106	126	146	166	186	206	226	246	266	286	24
25	0	2	22	40	58	72	83	91	97	102	107	111	38	58	78	98	118	138	158	178	198	218	238	258	38	58	78	98	118	138	158	178	198	218	238	258	38	58	78	98	118	138	158	178	198	218	238	258	288	25

Memoranda for Breweries.

Kettle Measures



Barrels	A	B	C	D	E	F	G	H
50	8' 6"	7' -	2' -	5' -	2' -	2' -	6"	3"
100	10' 6"	8' 6"	2' 6"	6' -	2' 6"	2' -	8"	4"
150	11' 6"	9' 3"	"	7' 6"	"	2' 6"	"	"
200	12' 6"	10' -	2' 10"	8' 6"	2' 10"	"	10"	5"
250	13' 6"	10' 6"	3' -	9' 6"	3' -	"	"	"
300	14' 6"	11' -	"	10' -	"	3' -	12"	"
350	15' -	11' -	3' 6"	10' 6"	4' -	"	"	"
400	16' -	12' -	4' -	11' -	"	"	"	"

Capacities for Appliances

Kettle	50 bārls.	100 bārls.	150 bārls.	200 bārls.	250 bārls.	300 bārls.	400 bārls.
Mash-tub	11' x 5' -	12' x 6' -	14' x 6' -	15' x 6' 6"	16' x 6' -	17' x 7'	18' x 7'
Bop-jack	7' x 8' x 5'	8' x 9' x 6'	10' x 12' x 6'	11' x 14' x 6'	12' x 14' x 6' 6"	14' x 15' x 7'	14' x 15' x 6"
Meal hopper	8' x 4' x 4'	8' x 6' x 4'	9' x 7' x 4' 6"	10' x 7' 6" x 5'	10' x 8' x 5'	11' x 8' x 5' 6"	12' x 10' x 6'
Beer-tank	8' 6" x 5'	10' x 6'	12' x 6'	14' x 6'	15' x 6'	16' x 6' 6"	18' x 7'
Water tank	8' 8' x 9' 6"	10' x 9' 16' 6"	12' x 9' 24' 6"	13' x 10' 31' 6"	14' x 10' 6' x 38' 6"	15' x 11' 46' 6"	16' x 13' 62' 6"
Rand ^e cooler Lengths of	27 tubes 14' long	34 tubes 16' long	42 tubes 18' long	42 tubes 18' long	42 tubes 20' long	48 tubes 20' long	2 ea 42 tubes 18' long
Grain tank hopper	6' 6" x 3' 6" x 4' -	8' x 8' x 4' 6" x 5' -	8' x 10' x 5' x 5' 6"	10' x 12' x 5' 6" x 5' 6"	10' x 12' x 6" x 6' 6"	11' x 13' x 6" x 6' 6"	12' x 15' x 7' x 6"

Weights of Materials.

Dry Woods.

	Lbs. Board ft.	Lbs. Cubic ft		Lbs. Board ft.	Lbs. Cubic ft.
Ash, American white.....	3.2	38.	Mahogany, Honduras	2.9	35.
Boxwood	5.	60.	Maple	4.1	49.
Cherry	3.5	42.	Oak, live	4.9	59.3
Chestnut	3.4	41.	Oak, white	4.0	48.
Cork	1.3	15.	Oak, red	3.2	40.
Elm	2.9	35.	Pine, white	2.1	25.
Ebony	6.3	76.1	Pine, yellow	2.8	34.3
Hemlock	2.1	25.	Pine, Southern	3.7	45.
Hickory	4.4	53.	Sycamore	3.1	37.
Lignum vitæ	6.9	83.	Spruce	2.1	25.
Mahogany, Spanish	4.4	53.	Walnut	3.2	38.

Building Materials.

	Lbs. Cubic ft.		Lbs. Cubic ft.
Brick, pressed	150	Granite or limestone, rubble work...	138
Brick, common	125	Granite or limestone, well dressed..	165
Cement, Portland	80 to 100	Limestones and marbles	168
Cement, Rosedale	56	Lime, quick	53
Common brickwork, cement mortar.	130	Mortar, hardened	103
Common brickwork, lime mortar....	120	Plaster of paris	141.6
Concrete cement	140	Sand	90-106
Earth dry, shaken	82 to 92	Sandstone	151
Earth, rammed	92 to 100	Shales	162
Glass, window	157	Slate	175
Granite	170	Trap rock	187

WOODEN BEAMS.

Table of safe quiescent loads for horizontal rectangular beams one inch thick, supported at both ends, the load equally distributed.

SPAN IN FEET	DEPTH OF BEAM IN INCHES.										
	6	7	8	9	10	11	12	13	14	15	16
5	800	1090	1420	1800	2220	2690	3200	3750	4350	5000	5690
6	670	910	1180	1500	1850	2240	2670	3130	3630	4170	4740
7	570	780	1010	1290	1590	1920	2280	2680	3110	3570	4060
8	500	680	890	1120	1390	1680	2000	2350	2720	3130	3560
9	440	600	790	1000	1210	1490	1780	2090	2420	2780	3160
10	400	540	710	900	1110	1340	1600	1880	2180	2500	2840
11	360	490	650	820	1010	1220	1450	1710	1980	2270	2590
12	330	450	590	750	930	1120	1330	1560	1810	2080	2370
13	310	420	550	690	850	1030	1230	1440	1680	1920	2190
14	290	390	510	640	790	960	1140	1340	1560	1790	2030
15	270	360	470	600	740	900	1070	1250	1450	1670	1900
16	250	340	440	560	690	840	1000	1170	1360	1560	1780
17	230	320	420	530	650	790	940	1100	1280	1470	1670
18	220	300	400	500	620	750	890	1040	1210	1390	1580
19	210	290	380	470	590	710	840	990	1150	1320	1500
20	200	270	360	450	560	670	800	940	1090	1250	1420
21	190	260	340	430	530	640	760	890	1040	1190	1350
22	180	250	320	410	500	610	730	850	990	1140	1290
23	170	240	300	390	480	580	700	810	950	1090	1230
24	160	230	290	370	460	560	670	780	910	1040	1180
25	160	220	280	350	440	540	640	750	870	1000	1130
26	150	210	270	340	420	520	610	720	840	960	1090
27	150	200	260	330	400	500	590	690	810	920	1050
28	140	190	250	320	400	480	570	670	780	890	1010
29	140	190	250	310	380	460	550	650	750	860	980
30	130	180	240	300	370	450	530	630	730	830	950

This table has been calculated for extreme fiber strain of 1,000 lbs. per square inch, giving a safety of 6 in ordinary building timber of fair quality.

Oak and yellow pine will carry a load one-fourth greater.

When more accuracy is required the weight of the beam itself must be deducted.

Care must be taken to let the beams rest for a sufficient distance on their supports to guard against crushing at the ends, especially in placing very heavy loads upon short, but deep and strong beams.

FORMULAE FOR ASCERTAINING STRENGTH OF BEAMS.

To ascertain the strength of a beam of any given size, or materials, multiply its width (in inches) by the square of the depth (in inches) and divide by the span (in feet)—multiply the quotient by the constant (co-efficient of strength) of material used, and the result will be the breaking load.

In ordinary practice a sixth of the "breaking" would be a "safe load."

Width in inches × sq. of depth in inches

Center breaking load in lbs. = Clear span in feet × constant*

Example: To ascertain the safe centre load in lbs. for a white pine beam 8 inches wide, 12 inches deep, 16 feet clear span.

$$\frac{\text{Width (in inches)} \times \text{square of depth (in inches)}}{\text{Clear span (in feet)}} \times \frac{\text{constant*}}{\text{factor of safety.}}$$

$$\frac{8 \times 144}{16} \times \frac{450^*}{6} = 5,400 \text{ lbs.}$$

* Constants or transverse strengths in lbs. for center loads are:

American white pine.....450 lbs.

American yellow pine.....550 lbs.

American white oak.....600 lbs.

Constants are for loads at rest.

Where beam is loaded at the center to get neat load, deduct $\frac{1}{2}$ weight of beam.

Where beam is uniformly loaded the strength is double, to get neat load deduct entire weight of beam.

LIMES, CEMENTS, PLASTERS.

Limes and Cements.—Natural limes and cements are produced by calcining limestones and other calcareous materials, in which process the carbonic acid and moisture they contain are driven off.

Hydraulic Limes are calcined from stone containing 73 to 92 per cent. of carbonate of lime, and a portion of clay, also soluble silica, carbonate of magnesia, alkalies, metallic oxides, and sulphates.

Cements.—There is no precise line between hydraulic limes and cements, the latter containing a larger proportion of clay than limes.

Natural Cements are calcined from stones containing carbonate of lime, a mixture of carbonate of lime and magnesia, together with a proportion of from 30 to 50 per cent. of clay. More than 40 per cent. of clay is injurious to the cements.

Hydraulic Cements are artificial cements made in a similar manner to hydraulic lime, but with a larger proportion of clay, silica, alumina, magnesia, etc. They do not slack after calcination, and some set under water at a temperature of 65 degrees in from 3 to 5 minutes and others in as many hours.

Portland Cement is an artificial cement. Good cement should be ground very fine, and should weigh from 95 to 130 pounds to the struck bushel. Slow setting cement is strongest. It is very important that sand used with cement be perfectly clean and sharp.

Mortar is lime and sand mixed with water. The setting process is a chemical change, the lime and the carbonic acid in the air combining to form a carbonate of lime, which as a cementing element encloses and binds together the particles of sand. The sand should be perfectly free from clay, loam or other impurities, or substitutes for sand may be used in the shape of well burnt clay, coriae from iron-works, slag from furnaces and cinders from coals.

Gypsum, or hydrated sulphate of lime is the basis of most plasters. It is a soft stone, which is either simply calcined, or calcined and combined with salts and alkalies.

Plaster of Paris is gypsum gently calcined till nearly the whole of the moisture is driven off. It can be cast in almost any form in wax or guttapercha moulds. It is also used with other plasters to quicken the setting.

Keene's Cement is plaster of paris soaked in a solution of alum and recalcined.

Parian Cement is gypsum calcined and powdered and mixed with a solution of borax, recalcined, ground, and mixed with a solution of alum.

Coarse Stuff is lime water mixed with hair or fiber.

Fine Stuff is lime slaked to a paste run to the consistency of cream, and allowed to harden to the required consistency for working by evaporation.

Gauged Stuff is plaster of paris added in the proportion of about 1 to 4 for its more rapid setting.

Rough Cast is washed gravels mixed with hot hydraulic lime; it is thrown with large trowels in a semi-fluid state upon an even surface of coarse stuff, and colored with lime wash and ochre.

Depeter is a "pricked up" coat of coarse stuff, into which small stone are pressed while in a wet state.

Depretor is plaster finished with a surface similar to cooled stone.

Pugging is coarse stuff put between floors for the purpose of deafening.

Papier Mache is paper reduced to a pulp or sheets of paper glued together and pressed in a metal mould to a required form.

Carton Pierre is similar to papier mache, but made with paper pulp, whiting and size, pressed into plaster moulds.

Fibrous Plaster is plaster of Paris in a thin coat laid on canvas strained on framework.



1.



2.



3.



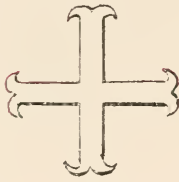
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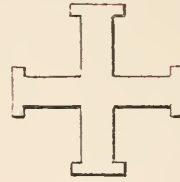
5.



6.



7.



8.



9.

CROSSES.

The cross, a symbol of Christianity, has very naturally been extensively used in the monuments of the middle ages. When the two branches of the cross are equal in length, as in Fig. 1, the cross is called a Greek cross, and when the stem is longer than the arms, as in Fig. 2, it is a Roman or Latin cross. When the figure has two arms, one longer than the other, as in Fig. 3 (the upper one meant as a representation of the inscription which was placed over the head of Christ) it is known by the name of the Lorraine cross, and has received that name from its being a bearing in the arms of the Dukes of Lorraine. By heralds this is called a patriarchal cross. The next cross, whose arms are triple, as Fig. 4, is the papal cross, and is one of the emblems of the papacy, signifying, perhaps, like the triple crown or tiara, the triple sovereignty over the universal church, the suffering church and the triumphant church. The great majority of the western churches, with transepts, are constructed in the form of the Latin cross, those in the form of the Greek cross being very rare. Those in the form of the Lorraine cross are still rarer, and rarer are those constructed with triple transepts. There is another form called the truncated or tau cross, as Fig. 5, having the form of that letter, on which, as a plan, a few churches have been built. Considered as respects the contour, the cross in blason has been variously shaped and named. Thus, Fig. 6, in which the extremities widen as they recede from the center, is called a cross patee. This is met with more frequently than any of the others. It is seen in the nimbus, on tombs, on shields, upon coins, etc.; and is the usual form of the dedication cross found in religious structures. Fig. 7 is by the French called anecree, the extremities forming hooks, but by heralds it is called the cross moline. Crosses flory are those in which the ends are formed into trefoils, as is seen in Fig. 4, the papal cross above mentioned. Fig. 8 is a cross potent, and Fig. 9 is the cross flechee, as respects the outer lines of its form: when it is voided, as shown by the inner lines, the ground or field is seen on which it lies.

MEASUREMENT OF OLD BRICKS.

Uncleaned rough from building dumped from 8-10.

Uncleaned stacked on outside and interior filled promiscuously, 10-12.

Cleaned and stacked, 16-18.

Cleaned, stacked on outside and interior filled promiscuously, 12-14.

RULE FOR CALCULATING PROPORTIONED WIDTH AND HEIGHT OF TREADS AND RISES OF STAIRS.

Subtract the width of tread from 24 in. and the result will be twice the height of the riser. Thus: if the tread is 10 in. wide, then $24 - 10 = 14 \div 2 = 7$ in., the height or riser proportionate to a 10 in. tread. This is exclusive of nosings.

MEMORANDA FOR PAINTERS.

(From "Builders' Guide and Price Book.")

Painters' work is generally estimated by the yard, and the cost depends upon the number of coats applied, besides the quality of the work, and the material to be painted.

One coat or priming, will take, for 100 yards of painting, twenty pounds of lead and four gallons of oil. Two-coat work, forty pounds of lead and four gallons of oil. Three-coat work, the same proportionate quantity as two coats; so that a fair estimate for 100 yards of three-coat would be 100 pounds of lead and sixteen gallons of oil.

One gallon priming oil color will cover 50 superficial yards.

One pound of paint covers about four superficial yards the first coat, and about six each additional coat. One pound of putty, for stopping every twenty yards.

One gallon of tar and one pound of pitch will cover twelve yards superficial the first coat, and seventeen yards each additional coat.

A day's work on the outside of a building is 100 yards of first coat, and 80 yards of either second or third coat. An ordinary door, including casings, will, on both sides, make eight to ten yards of painting, or about five yards to a door without casings. An ordinary window makes about two and one-half or three yards.

RULE FOR FINDING THE REQUIRED AREA FOR ANY CHIMNEY.

Multiply the nominal horse-power of the boiler by 112, and divide the product by the square root of the height of the chimney in feet. The quotient will be the required area in inches, at the top of chimney.

Table showing diameter and height of chimney for any boiler:

Horse-Power of Boiler.	Height of Chimney in feet.	Interior Diameter at top.	Horse-Power of Boiler.	Height of Chimney in feet.	Interior Diameter at top.
10	60	14 in.	70	120	30 in.
12	75	14 "	90	120	34 "
16	90	16 "	120	135	38 "
20	99	17 "	160	150	43 "
30	105	21 "	200	165	47 "
50	120	26 "	250	180	52 "
60	120	27 "	380	195	57 "

WEIGHT OF BRICKWORK.

Placing the weight of brickwork at 112 lb. per cubic foot, the weights per superficial foot for different walls are:

9 inch wall.....	84 lb.
13 inch wall.....	121 lb.
18 inch wall.....	168 lb.
22 inch wall.....	205 lb.
26 inch wall.....	243 lb.

ACOUSTICS.

The effect of length, height and width of rooms on their acoustics.—A writer in the "Arch. and Bldr." says: "To half the width of room add height of platform and height of the speaker, for height of room from floor to ceiling. The length of room from speaker may be $1\frac{1}{2}$ to twice the width, but should not exceed 90 ft." From examples of halls which have proved exceptionally successful for music, it appears that the height which would be far too great for a building for public speaking seems distinctly favorable for musical effect. A ratio of height to width and length should be as 2, 3 and 5, these proportions having proved eminently successful for music halls. For theaters no person should be over 70 feet from the speaker. The best shape for an auditorium is probably horse-shoe.

TO FIND THE RADIUS OF AN ARCH.

Centers—The following is the method to find the radius for arch centers $S =$ span $R =$ rise
 Then $\left\{ \frac{\left(\frac{S}{2}\right)^2}{R} + R \right\} \div 2$ or: To the square of half the span divided by the rise, add the rise and divide this sum by 2, and the result will be the radius required.

Example:—Suppose an arch 20 feet span and 5 feet rise then:

$$\left\{ \frac{10^2}{5} + 5 \right\} \div 2 = \frac{20 + 5}{2} = 12 \text{ ft. 6 in. the radius required.}$$

IRON GIRDERS.

The equal corresponding weight in the center of a girder caused by a certain ascertained weight coming at any other point of the same girder.

$W =$ Known Weight.

$L =$ The whole length between the bearings.

$D =$ Distance between resting point of W and the furthest support.

$D' =$ Distance between resting point of W and the nearest support.

$E =$ Half the distance between the supports.

$x =$ The equal corresponding weight or strain in the center.

WE

Then $x = \frac{WE}{D}$

Example.—Let $A B$ be a girder 12 ft. long with a girder resting on it 4 ft. from A with a known resultant weight of 5 tons, then x or strain at C (center)

$$\frac{5 \times 6}{8} = \frac{30}{8} \text{ or } 3\frac{3}{4} \text{ tons.}$$

To resolve the weight W into the two concurrent parallel forces at A and B , or the resultant weight or strain at the bearings. Taking the above example.

$$\text{Strain at } B = \frac{W D'}{L} \text{ or } \frac{5 \times 4}{12} = 1\frac{2}{3} \text{ tons.} \quad \text{Strain at } A = \frac{W D}{L} \text{ or } \frac{5 \times 8}{12} = 3\frac{1}{3} \text{ tons.}$$

When a beam is fixed at one end only, and has to support a weight uniformly distributed over the length the form of equal strength is a triangle, supposing the beam to be everywhere the same, but if the section of beam be circular, then the form of equal strength will be a semi-cubic parabola.

A cast iron girder if made too deep will be too rigid, and a comparatively small impulsive force will break it, the outline of the compressed side or top flange of a C. I. girder if to bear a weight uniformly distributed should be an arch the radius of which equals the square of half the length divided by the depth or

$$\left(\frac{L}{2} \right)^2 \div d \text{ where } L = \text{length of Girder between the bearings.}$$

$d =$ depth of Girder.

If the depth is obliged to be uniform then the outline of the breadth should be formed by setting two parabolas base to base, their verticals being in the middle of the length.

HINTS ABOUT PAINTING IRON.

Before painting iron, it should be thoroughly scraped, brushed and cleaned from all scale or rust.

Lead paints should not be applied to iron, as they erode the surface of the metal instead of protecting it. Oxide of iron paint is found both theoretically and practically to be anti-corrosive.

VELOCITY OF WIND.

10 miles, per square foot,	0.49 lbs.	50 miles, per square foot,	12.304 lbs.
20 miles, per square foot,	1.97 lbs.	60 miles, per square foot,	17.733 lbs.
30 miles, per square foot,	4.43 lbs.	70 miles, per square foot,	24.153 lbs.
40 miles, per square foot,	7.87 lbs.	100 miles, per square foot,	49.200 lbs.

LIQUID MEASURE.

31½ gallons = 1 barrel.	2 pints = 1 quart = 67.2 c. inches.
2 barrels = 1 hogshead.	4 quarts = 1 gallon = 268.8 c. inches.
1 barrel = 4½ cubic feet.	1 gallon U. S. = 8.34 lb.
8.665 cubic inches = 1 gill.	1 gallon U. S. = 231 cubic inches.
4 gills = 1 pint = 33.6 c. inches.	1 cubic foot = 7.48 U. S. gallons.

DRY MEASURE.

1 barrel pork = 200 pounds.	8 gallons = 1 bushel.
1 barrel fish = 200 pounds.	64 gallons = 1 quarter.
1 barrel flour = 196 pounds.	1 bushel = 1.28 cubic feet.
1 barrel salt = 280 pounds.	1 cubic foot corn = 42 pounds.
1 barrel beef = 200 pounds.	1 cubic foot rice = 48 pounds.
1 bushel corn = 56 pounds.	1 cubic foot hops = 27 pounds.
1 bushel oats = 30 to 33½ pounds.	1 carload = 680 bushels.
1 bushel wheat = 60 pounds.	1 c. foot Anthr. coal = 54 lbs.
1 bushel potatoes = 60 pounds.	1 ton Anthr. coal = abt. 40 c. ft.
2 gallons = 1 peck.	

PAPER.

24 sheets = 1 quire.	21½ quires = 1 ream printers'.
20 sheets = 1 quire outsidies.	2 reams = 1 bundle.
25 sheets = 1 quire printers.	10 reams = 1 bale.
20 quires = 1 ream.	60 skins = 1 roll of parchment.

WEIGHTS AND MEASURES—LINEAL MEASURE.

2¼ inches = 1 nail.	4 poles or 22 yards = 1 chain.
4 inches = 1 hand.	220 yards or 40 poles = 1 furlong.
3 inches = 1 palm.	1760 yards or 8 furlongs = 1 mile.
9 inches = 1 span.	7.92 inches = 1 link.
12 inches = 1 foot.	100 links or 66 ft. = 1 chain.
45 inches = 1 ell.	10 chains = 1 furlong.
3 feet = 1 yard.	80 chains = 1 mile.
6 feet = 1 fathom.	3 miles = 1 league.
16½ feet or 5½ yards = 1 rod, pole, or perch.	240 yards = 1 cable length.
	6086.07 feet = 1 knot or sea mile.

LENGTH OF A FOOT IN DIFFERENT COUNTRIES.

	Inches.		Inches.
Spain	11.03	Denmark	12.35
Holland	11.14	Prussia	12.36
Sweden	11.14	Austria	12.45
America	12	Portugal	12.96
England	12	Russia	13.75

LENGTH OF A MILE IN DIFFERENT COUNTRIES.

	Am. yards.		Am. yards.
Russian	1,100	Spanish	5,028
Italian	1,467	German	5,866
English	1,760	Swedish and Danish.....	7,233
American	1,760	Hungarian	8,630
Scotch	1,984	Norwegian	12,400
Irish	2,200	French league	3,666
Polish	4,400		

SQUARE MEASURE.

144 square inches = 1 square foot.
 9 square feet = 1 square yard.
 272½ feet = 1 square rod or pole.
 40 rods = 1 square rod.
 4 rods
 160 rods
 4,840 yards.
 43,560 feet
 10 square chains } = 1 acre.
 640 acres = 1 square mile.

2,471 acres = 1 hectare.
 7,840 square yards = 1 Irish acre.
 6150 square yards = 1 Scotch acre.
 30 square acres = 1 yard of land.
 100 acres = 1 hide of land.
 40 hides = 1 barony.
 36 sq. miles = 1 township.
 640 acres = 1 section.
 About 14 25x125 ft. lots = 1 acre.

SOLID OR CUBIC MEASURE.

1728 cubic inches = 1 cubic foot.
 27 cubic feet = 1 cubic yard.
 40 cubic feet of rough or 50 cubic feet
 of hewn timber = 1 ton or load.

108 cubic feet = 1 stack of wood.
 128 cubic feet = 1 cord of wood.
 40 c. ft. = 1 U. S. A. shipping ton.
 42 c. ft. = 1 British shipping ton.

AVOIRDUPOIS WEIGHT.

16 drachms = 1 ounce.
 16 ounces = 1 pound.
 28 pounds = 1 quarter.

112 pounds = 1 cwt.
 20 cwt. = 1 ton.

TROY WEIGHT.

24 grains = 1 dwt.
 20 dwt. = 1 oz.

12 oz. = 1 lb.

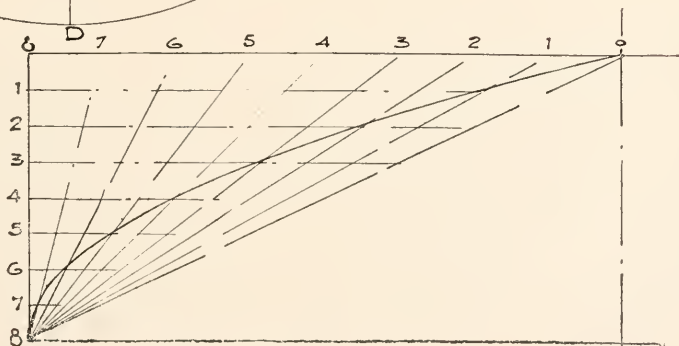
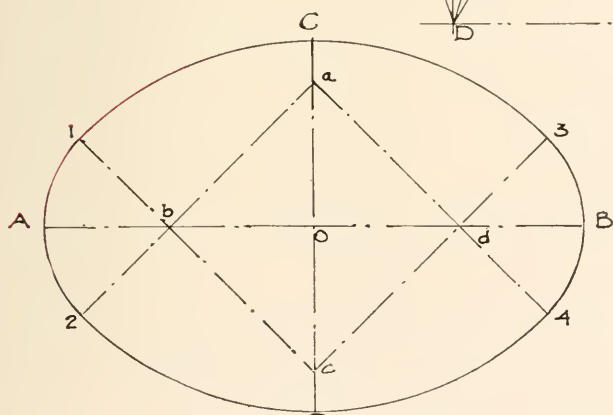
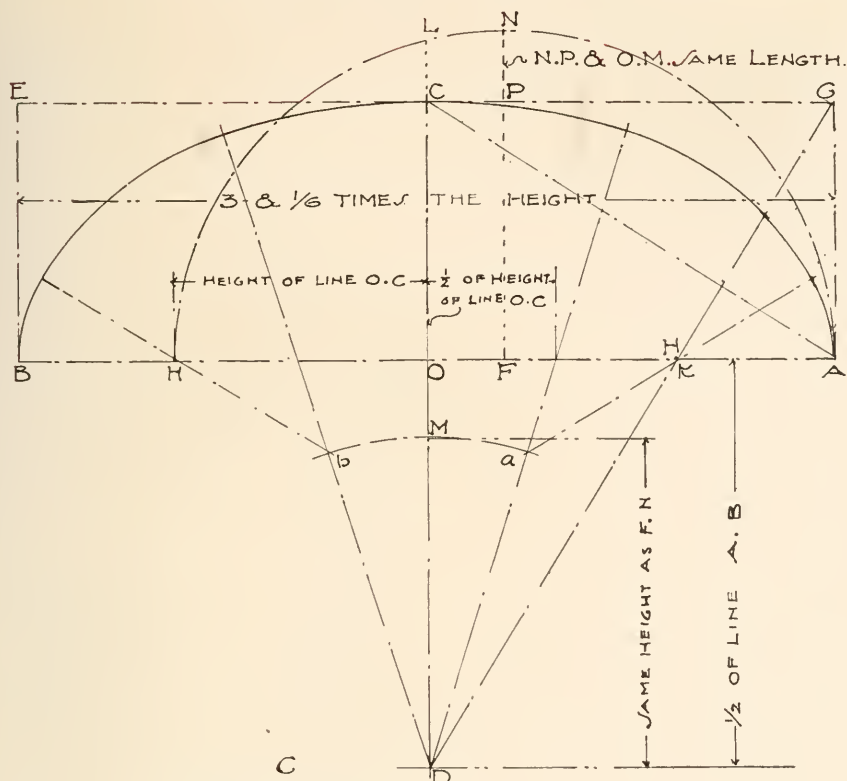
SIZES OF PAPER (Whatman's).

	Inches.		Inches.
Emperor	72 x 48	Royal	24 x 19
Antiquarian	53 x 31	Medium	22 x 17½
Double elephant	40 x 26¾	Demy	20 x 15½
Atlas	34 x 26	Large post	20¾ x 16¾
Colombier	34½ x 23½	Post	19 x 15¼
Imperial	30 x 22	Foolscap	17 x 13½
Elephant	28 x 23	Post	15 x 12½
Super royal	27 x 19	Copy	20 x 16

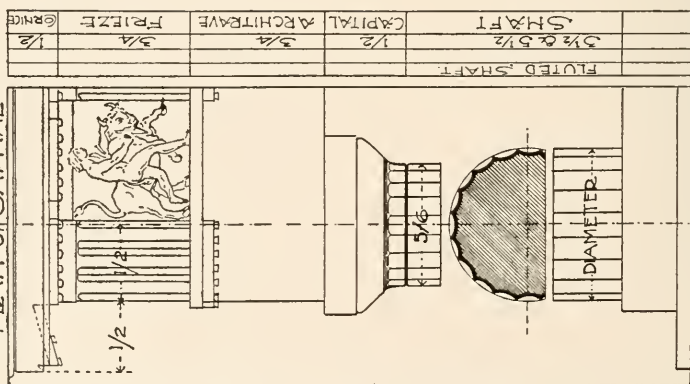
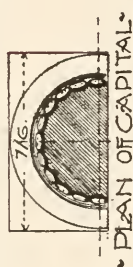
TABLE OF SQUARE ROOTS.

No.	Sq. Root.	No.	Sq. Root.	No.	Sq. Root.	No.	Sq. Root.
25	5.	650	25.46	1400	37.42	2600	50.99
50	7.071	700	26.46	1450	38.08	2700	51.96
75	8.66	750	27.39	1500	38.73	2800	52.91
100	10.00	800	28.28	1550	39.37	2900	53.85
125	11.18	850	29.15	1600	40.00	3000	54.77
150	12.25	900	30.00	1650	40.62	3200	56.57
175	13.23	950	30.82	1700	41.23	3400	58.30
200	14.14	1000	31.62	1800	42.43	3600	60.00
250	15.81	1050	32.40	1900	43.59	3800	61.64
300	17.32	1100	33.16	2000	44.72	4000	63.24
350	18.70	1150	33.91	2100	45.82	4200	64.80
400	20.00	1200	34.64	2200	46.90	4400	66.32
450	21.21	1250	35.36	2300	47.95	4600	67.82
500	22.36	1300	36.06	2400	48.99	4800	69.28
550	23.45	1350	36.74	2500	50.00	5000	70.72
600	24.49						

• PROBLEMS ON THE ELLIPSE & PARABOLA •



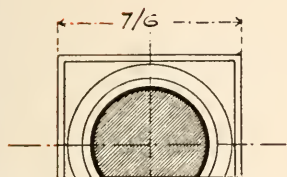
GREEK-DORIC



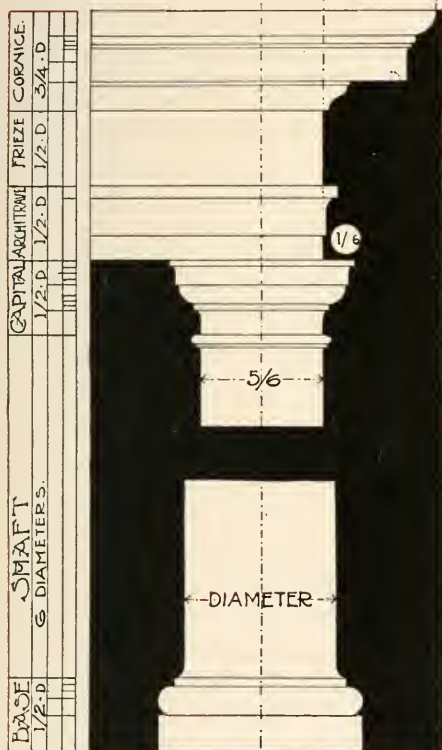
COMPARISON OF THE ORDERS

PEDESTAL	ENTABLATURE		GREEK-DORIC		TUSCAN		DORIC		IONIC		CORINTHIAN COMPOSITE	
	NAMES OF FEATURES											
CAP	CODICIE	CYMATIUM CORONA BED MOULD	2	1/2	1 3/4	3/4	2	3/4	2 1/4	7/8	2 1/2	1
	FRIEZE			3/4		1/2		3/4		6/8		3/4
DIE	ARCHITRAVE	TÆNIA		3/4		1/2		1/2		5/8		3/4
	CAPITAL	ABACUS ECHINUS BECKING ASTRAGAL		1/2		1/2		1/2		1 1/3		7/6
BASE	SHAFT		4-6									
THIS CAP IS ONE NINTH THE HEIGHT OF THE PEDESTAL												
PEDESTAL IS HEIGHT OF COLUMN.												
[VIGNOLA] * Alex A. Feller del.												
THE BASE IS TWO NINTHS THE HEIGHT OF PEDESTAL												

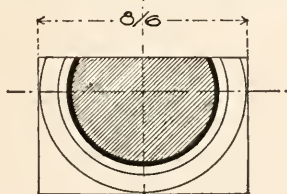
TUSCAN ORDER



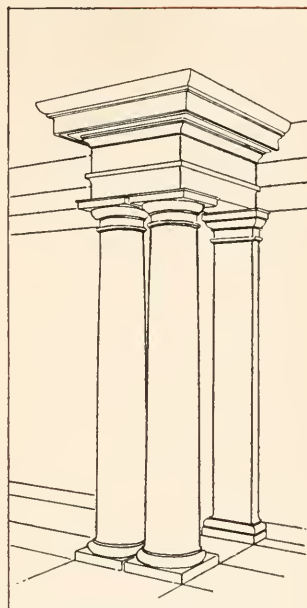
PLAN OF CAPITAL
* 5/12 * - 3/4 - - *



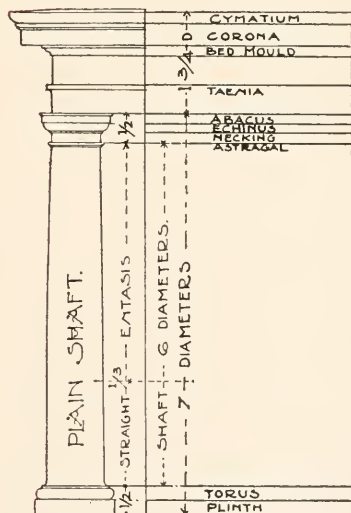
• ELEVATION OF BASE CAPITAL •
• & ENTABLATURE •



• PLAN OF BASE •

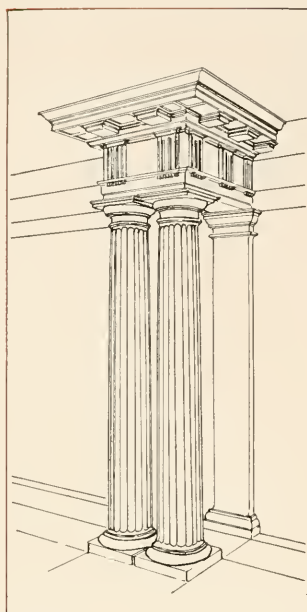


• PERSPECTIVE VIEW •

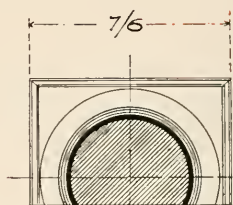


~ COMPLETE ORDER ~

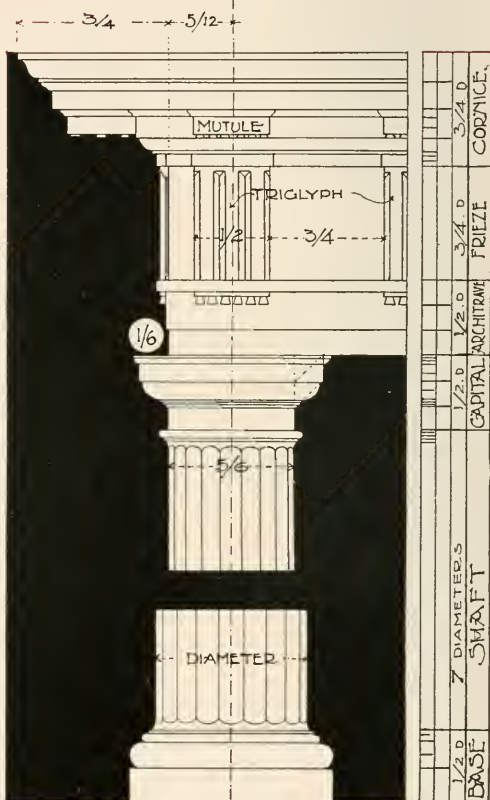
DORIC ORDER



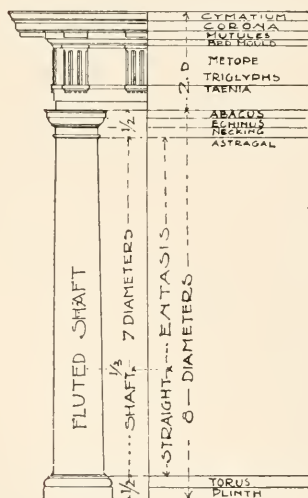
• PERSPECTIVE VIEW •



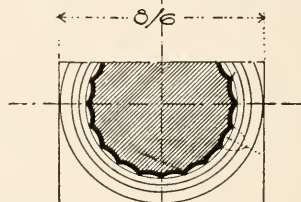
PLAN OF CAPITAL.



~ ELEVATION OF BASE CAPITAL ~ ~ & ENTABLATURE ~

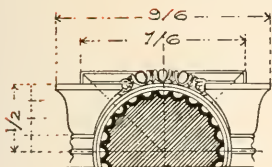


• COMPLETE ORDER •



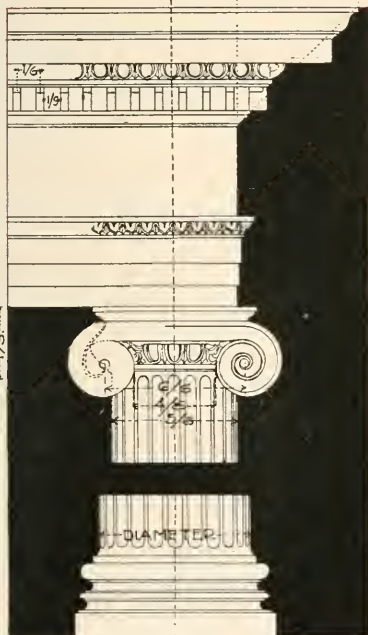
• PLAN OF BASE •

IONIC ORDER

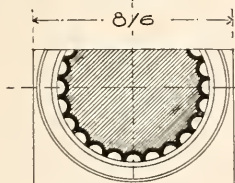


PLAN OF CAPITAL

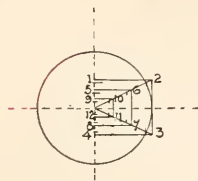
BASE	SHAFT	CAPITAL	ARCHITRAVE	FRIEZE	CORNICE
1/2 D	8 1/8 D	1 1/2 D	5 D	6 D	7 1/2 D



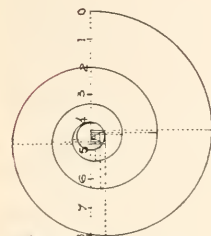
ELEVATION OF BASE CAPITAL & ENTABLATURE



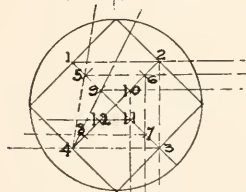
PLAN OF BASE



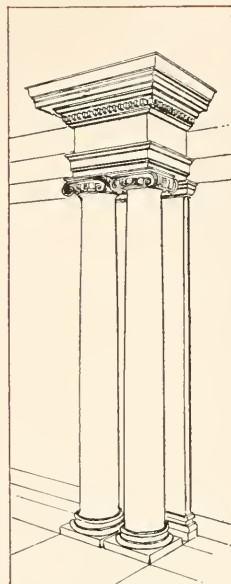
SIDE OF CAPITAL



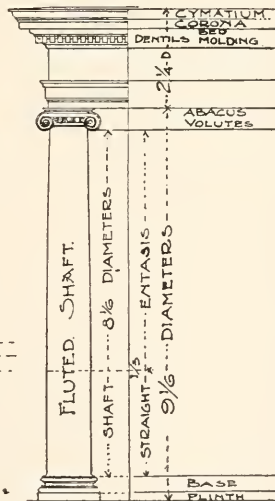
VOLUTE



EYE OF VOLUTE

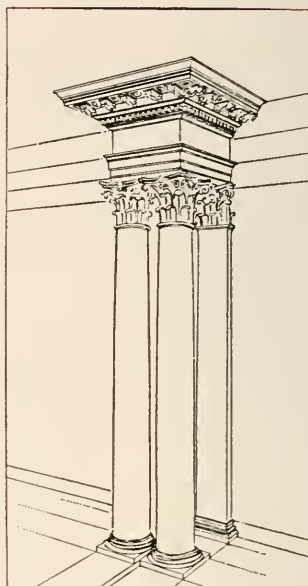
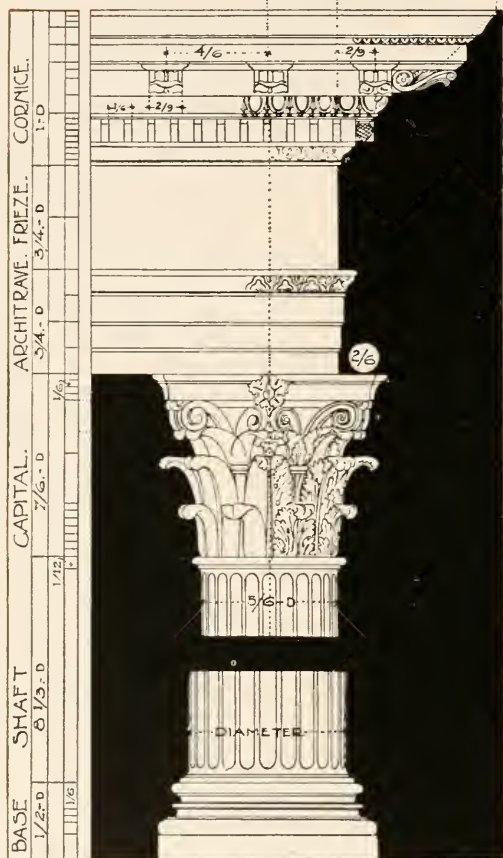
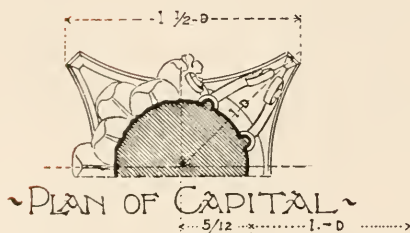


PERSPECTIVE VIEW



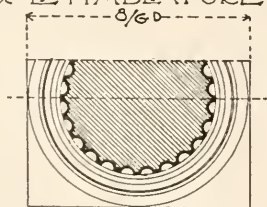
COMPLETE ORDER

CORINTHIAN ORDER.

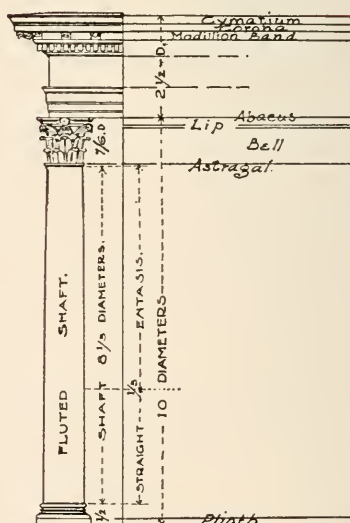


~ PERSPECTIVE VIEW ~

~ ELEVATION OF BASE CAPITAL
& ENTABLATURE ~

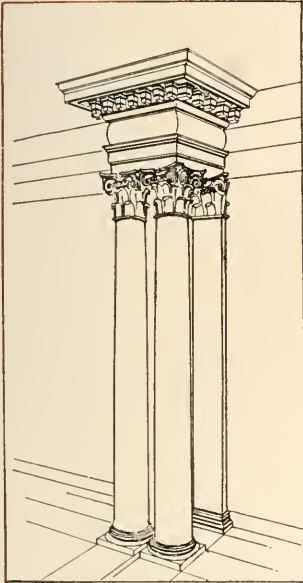


PLAN OF BASE.

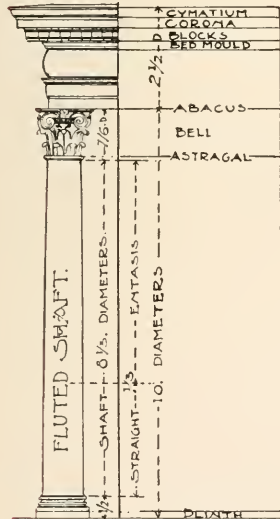


COMPLETE ORDER.

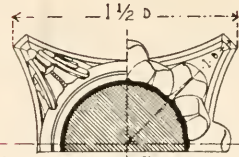
COMPOSITE ORDER



~ PERSPECTIVE VIEW ~



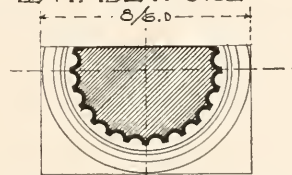
~ COMPLETE ORDER ~



~ PLAN OF CAPITAL ~

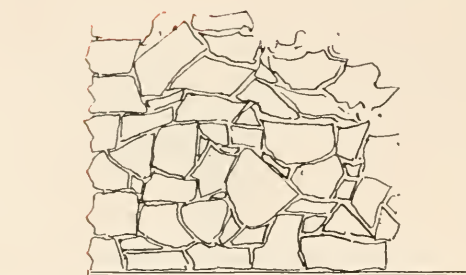


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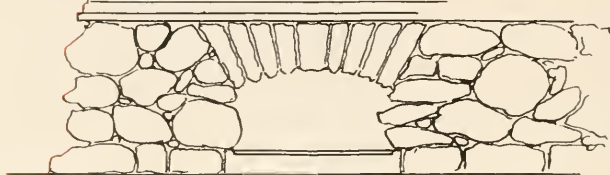


~ PLAN OF BASE ~

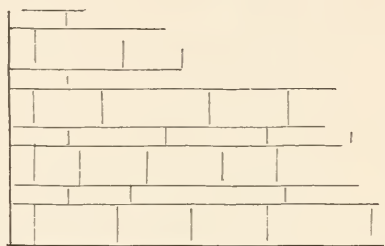
Suggestions for Setting Stone.



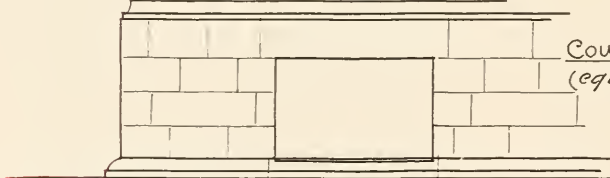
Split Boulder Work



Boulder Work.



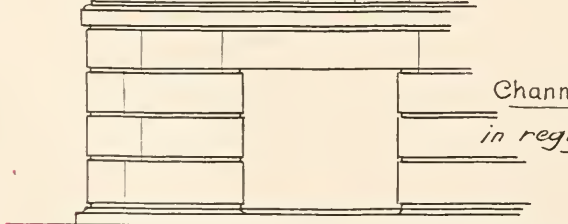
Coursed Ashlar.
(unequal heights.)



Coursed Ashlar.
(equal heights.)

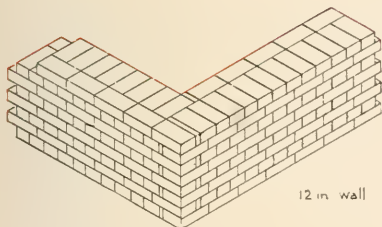


Random Range.

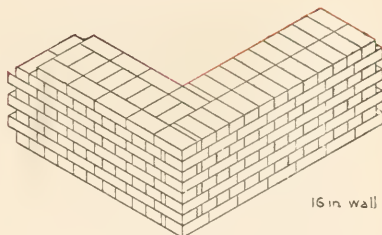


Channeled joint
in regular courses.

Bonds Used in Laying Brickwork.



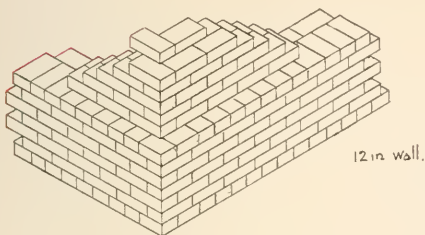
12 in. wall



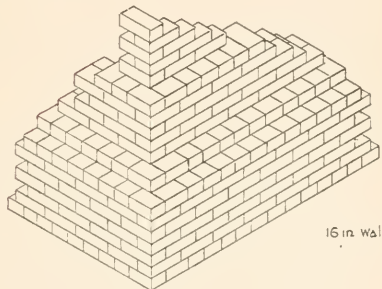
16 in. wall

English Bond.

One row of headers and one of stretchers in alternate courses.



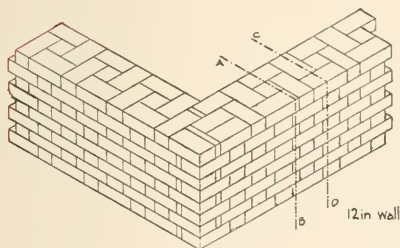
12 in. wall



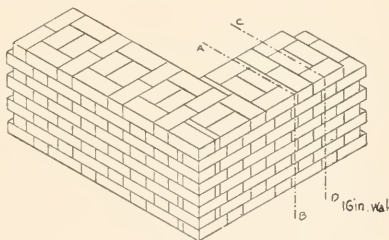
16 in. wall

Chicago Bond.

One row of headers and five courses of stretchers.



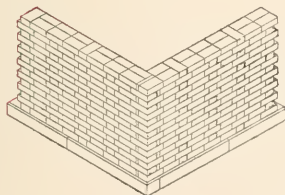
12 in. wall



16 in. wall

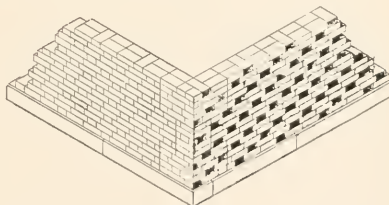
Flemish Bond.

Headers and stretchers alternating in each course.



English Garden Wall Bond.

Three stretchers and one header alternating in each course.



German Cross Bond.

Two stretchers and one header alternating in each course.



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INDEX TO BUILDING ORDINANCE.

(See pages 67 to 108.)

See page 109 for The Tenement House Ordinance and the Special Index for same on page 269.

Theatre Ordinance, embracing Classes 4 and 5, page 121, and Index for same page 273.

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INDEX TO TENEMENT HOUSE ORDINANCE.

(See page 109 for Ordinance.)

Passed December 17, 1902, and Amended December 22, 1902, and March 2, 1903.

To improve the construction, sanitation, convenience and safety of tenement houses.

B. O. refers to Building Ordinance of 1898.

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Yard	Sub Sec. 3 1
Court	Sub Sec. 4 1
Shaft	Sub Sec. 5 1
Public Hall	Sub Sec. 6 1
Stair Hall	Sub Sec. 7 1
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Commercial and Corporation Law and Collections.

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SCHOOL ORDINANCE.

Passed July 14, 1904.

Be it ordained by the City Council of the City of Chicago:

Section 1. That the ordinance relating to the Department of Buildings, and governing the erection of buildings, etc., in the City of Chicago, passed March 28, 1898, and all subsequent amendments thereto, be and the same is hereby further amended by adding the following sections thereto:

“Section 1. Buildings of Class VIII. shall include all buildings used exclusively for school purposes.”

“Sec. 2. Construction of Buildings of Class VIII.—All buildings of Class VIII. hereafter erected shall be constructed as follows, viz.:

Buildings of this class having a seating capacity of less than 400, or which are not over two stories and basement in height, may be built of ordinary construction.

Buildings of this class having a greater seating capacity than 400, and less than 800, or which are not over three stories and basement in height, shall be built of slow burning construction or fireproof construction.

Buildings of this class having a greater seating capacity than 800, or which are more than three stories and basement in height, shall be built entirely of fireproof construction.

New additions to existing buildings may be built, provided, however, that such new additions shall comply with above requirements.

All alterations in existing buildings of Class VIII., other than new additions thereto, intended to make them comply with the requirements of this ordinance may be executed in the same materials of construction at present employed in such buildings, unless otherwise distinctly provided by this ordinance.

Portable frame buildings of Class VIII. not larger than 28 feet by 36 feet and not over one story high, may be erected in the city, provided the exterior walls and roof of same are covered with metal or incombustible material, and the interior woodwork painted with fire-proof paint, suitable to and approved by the Commissioner of Buildings. And, provided further, that the location of such buildings shall be approved by the Commissioner of Buildings. Such portable buildings shall not be located nearer than 10 feet to any other building, and shall not be maintained on any one lot or block for a longer period than two (2) years after the date of the issuance of the permit therefor without a new permit from the Commissioner of Buildings.

No wall of any building of Class VIII. containing a window opening shall be nearer than five (5) feet to any lot line of adjoining property (street and alley lines not included)."

"Sec. 3. Thickness of Walls of Buildings of Class VIII.—The following regulations shall govern the construction of buildings of Class VIII.:

The thickness of surrounding walls and of all dividing walls carrying the load of floors or roof shall be as indicated in the following table, to-wit:

	Basement in.	Stories				
		1st in.	2d in.	3d in.	4th in.	5th in.
One story	16	12	..	..	..	..
Two stories	16	16	12	..	..	..
Three stories	16	16	16	12	..	..
Four stories	20	20	16	16	12	..
Five stories	24	20	20	16	16	16

Buildings built of Skeleton Fireproof Construction shall be excepted from the foregoing provisions and shall comply with the provisions of the building ordinance governing such buildings."

"Sec. 4. The floors of buildings of Class VIII. shall be designed and constructed so as to be capable of bearing in all their parts, in addition to the weight of partitions and permanent fixtures and mechanisms that may be set upon same, a live load of seventy-five (75) pounds per square foot.

No story above the basement shall be less than twelve (12) feet in height in the clear."

"Sec. 5. The following limitations of floor levels of auditoriums or assembly halls of buildings of Class VIII. shall be observed in all cases:

In Buildings of Fireproof Construction.

Not to exceed 2,000 seating capacity, not over 10 feet above sidewalk level.

Not to exceed 1,000 seating capacity, not over 30 feet above sidewalk level.

Not to exceed 800 seating capacity, not over 50 feet above sidewalk level.

Not to exceed 500 seating capacity, in any story, provided, however, that there shall be at least two separate and distinct stairways from the floor in which such auditorium or assembly hall is located to the ground, each of which shall be not less than four (4) feet wide in the clear.

In Buildings Having Stairs and Corridors of Fireproof Construction.

Not to exceed 1,500 seating capacity, not over 10 feet above sidewalk level.

Not to exceed 1,000 seating capacity, not over 25 feet above sidewalk level.

Not to exceed 800 seating capacity, not over 42 feet above sidewalk level.

Not to exceed 500 seating capacity, not over 50 feet above sidewalk level.

Not to exceed 250 seating capacity, not over 60 feet above sidewalk level.

In All Other Buildings of Class VIII.

Not to exceed 1,000 seating capacity, not over 10 feet above sidewalk level.
Not to exceed 650 seating capacity, not over 30 feet above sidewalk level.
Not to exceed 500 seating capacity, not over 45 feet above sidewalk level.
Not to exceed 200 seating capacity, not over 60 feet above sidewalk level.

Heights shall be measured from sidewalk level at entrance of buildings to highest part of main floor of auditorium or assembly hall."

"Sec. 6. Stairs in buildings of Class VIII. shall be in width equivalent to fifteen (15) inches for every hundred (100) persons in such building as measured by the seating capacity of the class rooms; provided, however, that the number of persons allowed in said buildings at any one time shall be limited by the width of stairways available as exits therefrom.

No stairs shall be less than four (4) feet wide in the clear, except where more than two stairs lead down from any floor, in which case stairways three (3) feet wide in the clear may be counted in the total width of stairs required.

Where two or more stairways are used, they shall be placed at opposite ends of buildings or as far apart as practicable, and all buildings hereafter erected shall have at least two separate and distinct stairways from the ground floor to the top floor, and all existing buildings shall have two such separate and distinct stairways, or one stair and one stair or sliding fire escape.

All stairways shall have railings on each side thereof.

No stairway shall ascend a greater height than eleven (11) feet without a level landing, which if its width is in the direction of the run of the stairs, shall be not less than four (4) feet wide, or which, if at a turn of the stairs, shall be of not less width than the stairs, and no winder shall be permitted in any stairs.

In buildings of Class VIII. hereafter erected more than two stories and basement in height, the stairs and their enclosing walls shall be of fireproof construction.

The width of corridors, passages, hallways and doors shall be computed in the same manner as that herein provided for stairways, provided, however, that no corridors shall be anywhere less than five (5) feet in width, and no door less than three (3) feet in width, except where two or more doors, each two feet four inches (2 ft. 4 in.) or more in width are grouped together.

All doors in buildings of Class VIII. shall open outward, and all entrance and exit doors shall be unlocked at all times when building is occupied for school purposes, or open to the public.

All exit doors from assembly halls to other parts of the building shall be covered with metal or other fireproof material, approved by the Commissioner of Buildings."

"Sec. 7. Aisles in auditoriums and assembly halls of buildings of Class VIII. shall be in width equivalent to eighteen (18) inches for every one hundred (100) seats; but no aisle shall be less than two feet six inches (2 ft. 6 in.) wide in its narrowest part. All groups of seats shall be so arranged that they shall have an aisle on each side, and not more than twelve (12) seats shall be placed between aisles.

Aisles in class rooms, recitation rooms and study rooms of buildings of Class VIII. shall be in width equivalent to eighteen (18) inches for every one hundred (100) permanent seats; but no main or cross aisles shall be less than two feet six inches (2 ft. 6 in.) wide in its narrowest part.

All aisles and passageways in said buildings shall be kept free from camp stools, chairs, sofas and other obstructions, and no person shall be allowed to stand in or occupy any of said aisles or passageways during any performance, service, exhibition, lecture, concert or any public assembly, nor shall there be any chairs, settees or camp stools in such aisles or corridors at such times or occasions.

All auditoriums or assembly halls of buildings of Class VIII. having a seating capacity of eight hundred (800) or more shall be provided with emergency exits. The aggregate width of such emergency exits, which shall be provided for each floor, balcony or gallery of such auditorium or assembly hall, shall be one-half of that provided for the main exits. No emergency exit or stairway shall be less than three (3) feet in width."

"Sec. 8. All exits opening from auditoriums and assembly halls of buildings of Class VIII. shall have the word 'exit' in letters at least six (6) inches high, applied to the auditorium side of every exit, and when said auditorium or assembly hall is used at night a red light shall be kept burning over the word 'Exit' during the entire time such building is so used and until the pupils or audience have left the building."

"Sec. 9. Every portion of any building of Class VIII. devoted to the uses or accommodation of the public also all outlets leading to the streets, and including the

open courts and corridors, stairways and exits, shall be well and properly lighted during the entire time the same is in use, and the same shall remain lighted until all the pupils or the audience have left the premises. All gas or electric lights in the halls, corridors, lobbies, stairs and exits leading from the auditorium or assembly halls shall be controlled by a separate shut-off and shall be independent of all other lights in such building.

The total glass area of outside windows and skylights of each class room or study room of buildings of Class VIII shall be not less than one-ninth (1-9) of the floor area of such room."

"Sec. 10. In buildings of Class VIII, in which the lowest or basement floor is below finished grade at building and which is used in part or as a whole for heating or ventilation apparatus, shall be considered the basement story of said building."

"Sec. 11. All buildings of Class VIII, of four (4) or more stories in height shall be provided and equipped with one or more stair or sliding fire-escapes, in such locations and numbers as shall be satisfactory to the Commissioner of Buildings.

It shall be the duty of the janitor of any such building or such other employe or employes thereof as may be directed, to personally go down all fire escapes of buildings of Class VIII, from topmost story to ground, and to examine and operate all doors, windows, etc., leading to and from such fire escapes; and such inspection shall be made at least once each and every week that such building is used for school purposes, and a written report made of such inspection to the Principal of said school, showing the time it was made and the condition of the fire escapes.

Said fire escapes must be kept in good condition ready for immediate use at any and all times that such building is in use, including the removal of all snow and ice."

"Sec. 12. The Principal or other person in charge of the pupils in every building of Class VIII, shall establish and maintain a good and efficient fire drill which shall be practiced at least twice each month during the time said building is used for school purposes.

A record shall be kept by the Principal or other person in charge of the pupils, when each fire drill is held and of the time that elapses from the first fire signal until the last person is out of the building."

Sec. 2. This ordinance shall be in force from and after its passage and due publication.

THEATRE ORDINANCES.

Class 5, published page 125, was amended as far as it relates to alterations in existing Theatres, as follows, and passed July 18, 1904.

As the Original Theatre Ordinance, passed January 18, 1904, was already in print, this method is taken to present the changes made to date. The numbers of the Sections originally used by the Committee are adopted.

Sec. 27, page 125, add after third line: Provided, however, that public halls and club halls with a seating capacity of less than 600, although occasionally used for theatrical representations, shall not be construed to be public theaters within the meaning of the term as used in this section, notwithstanding the fact that movable scenery is used upon the stage thereof on such occasions, and such public halls and club halls shall not be considered as buildings of Class V, as herein defined. Such public halls and club halls shall be included in Class IV, as defined in Section 1 of the said ordinance of January 18, 1904, as amended.

The following provisions shall apply to buildings of Class V, now in existence:

Add after the words "blank walls" at end of Sec. 27, on page 126: Provided, that if in any building of this class now in existence the structural part thereof do not comply with the foregoing requirements and structural changes are made therein, then all walls, columns or other structural parts shall be strengthened in a manner satisfactory to the Commissioner of Buildings.

Sec. 29. Location, etc., is omitted.

Sec. 30, page 126. Strike out the words, "all buildings of Class V. hereafter erected shall be built entirely of fireproof construction."

Sec. 31, page 126, is changed as follows: Classes I., II., III. or IV. Built in Conjunction with Class V.—Doors for Openings Between Connecting Buildings.—In all cases where existing buildings of Class V. are built in conjunction with or as part of buildings devoted to the uses of Classes I., II., III., or IV., and where such buildings of Classes I., II., III. or IV. are not built entirely of fireproof construction, double iron doors shall be placed at each connecting opening between such buildings of Class V. and the building connected therewith.

Sec. 32 reads as follows: Limitations of Floor Levels.—The audience room or rooms or auditorium or auditoriums in any building containing in the aggregate not more than 500 seats, if in a fireproof building, may be located in any story thereof, but in such case there shall be at least two separate stairways from the floor or floors in which such audience room or auditorium is located to the ground, each of which stairs shall not be less than four feet in width in the clear.

This section governing floor levels, shall not apply to buildings of Class V. now existing where the lowest bank of seats of the main floor is not more than twelve feet above the street level. But such building must be fireproof and in all other respects conform to the requirements of the building ordinance.

Sec. 33, page 126. In place of first two paragraphs read: Stairs shall be in width equivalent to 20 inches for every 100 seats, and for fractional parts of 100 a proportionate part of 20 inches of width shall be added, but in no event shall any stairway be less than four feet wide in the clear, except as hereinafter provided.

After the word "exit" at the end of paragraph 5, Sec. 33, read to end of section as follows:

Steps shall not have a greater rise than seven and three-eighths inches, treads shall not be narrower than eleven inches, and winders shall not be used on any staircase, except where circular staircases are expressly permitted.

In existing theaters each and every balcony and gallery shall have separate and distinct entrance stairways from the sidewalk level, except that in cases where the vestibule or entrance to said theater is not more than fifteen (15) inches, or two steps, above the sidewalk level and said steps are at or near the building line the stairs to such balcony and gallery may ascend from the floor of said vestibule or entrance, but if the run of the stairs at the bottom is not toward the street there shall be a hand rail or rails three feet above the floor constructed from the foot of said stairs for a distance of not less than five feet leading toward the street. All doors intervening between said stairs and the street shall, during each and every performance, be kept unfastened.

There shall be an iron stair or stairs from the stage to the fly gallery and gridiron, continuing to the roof of the building or to some fireproof passageway or exit. Said stairs may be circular. Such circular stairs, however, shall not be used for access to the dressing rooms.

Stairs leading to a box or boxes seating not to exceed thirty people, in the aggregate, shall be independent of all other stairs and seats and not less than two feet eight inches wide in the clear.

All stairs on the stage side of the proscenium wall shall not be less than two feet six inches wide.

Instead of increasing the width required for entrances, aisles, exits and stairways to that required by this ordinance, the owner, lessee or manager shall have the privilege of reducing the number of permanent seats until the same ratio between said width and number of seats shall be established, and if such privilege be taken advantage of it shall be the duty of the Commissioner of Buildings to make inspection and certify that said ratio actually exists before license for operation of said theater shall be issued."

Sec. 34, page 127. The following changes have been made in this section after words "three feet" at end of 5th line to the paragraph beginning "no foyer" insert:

Every aisle shall lead as nearly as possible directly to an exit, but in no case shall the center line of said exit be more than three feet from the center line of said aisle leading thereto.

More than ten (10) seats in any one row between aisles in any gallery shall not be lawful. On the main floor and balcony eleven (11) seats between aisles will be permitted; provided, however, that in banks of seats on main floor and balcony that are not at a greater distance than twenty (20) feet from an exit, thirteen (13) seats will be permitted between aisles.

Seats shall be not less than twenty inches in width measured at the top of the seat backs.

Rows of seats shall be not less than two feet eight inches from back to back.

No bank of seats shall be of a greater rise than twenty-two inches.

All groups of seats shall be so arranged that there shall be an aisle at each side of each group, provided, however, that groups of five seats or less may abut a tunnel at one side and an aisle at the other side.

The number of banks of seats on the "main floor" shall not exceed fifteen unless an intervening or cross aisle is provided between each fifteen banks of seats or a direct exit is provided for each aisle.

The number of banks of seats in the "balcony" shall not exceed nine unless an intervening or cross aisle is provided between each nine banks of seats or a direct exit is provided for each aisle.

There shall be no more than twelve feet rise, measured vertically, in any aisle in any gallery without a direct exit by tunnel or otherwise to a corridor with free opening onto the gallery stairs or other direct discharge to the street, or at the said elevation of 12 feet an intervening or cross aisle leading directly to an exit. No tunnel shall be less than three feet wide in the clear.

Sec. 35, page 128, omit paragraph beginning "Additional Emergency Exits," and in paragraph 6 "Fire Escapes" and insert words "Emergency Stairway" in place thereof.

Sec. 37, page 128, paragraph beginning "No scenery" to read:

No scenery shall be used upon the stage unless such scenery shall have been treated with a paint or chemical solution which shall make it noncombustible and which shall be approved by the Fire Marshal. Or if such scenery is already treated with a paint or chemical solution designed to make it noncombustible it shall not be used upon the stage until the Fire Marshal, after a sufficient test of such scenery, has approved it as being noncombustible.

Sec. 38, on page 129, is omitted.

Sec. 39, page 129. In place of first two paragraphs insert the following:

Vents, Size Of—Flue Pipes—Dampers—Switches for Dampers.—One or more vents, or flue pipes of metal construction, or other noncombustible material, suitable for carrying away smoke, and approved by the Commissioner of Buildings, and extending not less than fifteen (15) feet above the highest point of the roof, and equivalent in area to one-twentieth of the area of the stage, shall be built over the stage.

In buildings where additional stories are built above the stage, such vents or flue pipes may be carried out near the top of the stage walls and shall be continued and run up on the exterior of the building to a point five feet above the highest point of the additional stories.

All such flues or vents shall be provided with metal dampers, and shall be opened by a closed circuit battery, suitable to and approved by the City Electrician.

Sec. 40, page 129. Automatic sprinklers above and below the stage are not required.

Sec. 41, page 129. Substitute the following:

Fire Apparatus on Stage—Hand Fire Pumps—Fire Materials.—A standpipe not less than two and one-half inches in diameter shall be installed on each side of the stage with a hose connection at the stage and each level above and below the stage and hose connected thereto with a hose valve. Such standpipes shall be connected with a tank on the roof containing not less than three thousand gallons of water, protected from frost, and also with a power pump, all of which shall be subject to the approval of the Fire Marshal. Portable fire extinguishers or hand fire pumps shall always be kept ready for use on and under the stage; in fly galleries and in rigging aloft, and in addition thereto at least four fire department axes and six pike poles shall be kept ready for use on each tier or floor of the stage, all of which shall be subject to the approval of the Fire Marshal.

The use of ordinary hot air furnaces or stoves is strictly prohibited.

Sec. 43, page 130. Insert the words "Gas or" before "Sperm oil."

Sec. 46, page 130. After the words "Fire Marshal" insert "and the City Electrician."

Omit the last paragraph beginning "It shall be the duty of the person."

Sec. 48, page 131. Strike out the words "Commissioner of Buildings" and insert "City Electrician."

NEW THEATRES.

Amendments to Ordinance of January 18, 1904, and passed July 18, 1904, Governing the Erection of Theatres.

Secs. 30 and 31, page 126. The last paragraph in each of these sections is omitted, as it refers to changes in existing buildings.

Sec. 32, page 126. The last paragraph is omitted for the same reason as above.

Sec. 33, page 126. After paragraph three insert the following, in place of paragraphs 4, 5, 6 and 7:

Steps shall not have a greater rise than seven and three-eighths inches, treads shall not be narrower than eleven inches, and winders shall not be used on any staircase.

Each and every balcony and gallery shall have separate and distinct entrances and stairways from the sidewalk level. The bottom run of the stairs shall be directly toward the street. These stairs may ascend from the vestibule or entrance inside the building, but the bottom riser of these stairs shall be not more than sixty-five (65) feet from the building line. All doors between said stairs and the street shall be kept unlocked and unfastened during each and every performance and until the audience has left the building.

There shall be an iron stair or stairs from the stage to the fly gallery or gridiron, continuing to the roof of the building or to some fireproof passageway or exit. Said stairs may be circular. Such circular stairs, however, shall not be used for access to the dressing rooms.

Stairs leading to a box or boxes seating not to exceed thirty people in the aggregate shall be independent of all other stairs and seats, and not less than two feet eight inches wide in the clear.

Omit last paragraph relating to existing theaters.

Sec. 34, page 127. After the sixth paragraph insert:

No bank of seats shall have a greater rise than twenty-two inches.

All groups of seats shall be so arranged that there shall be an aisle at each side of each group, providing groups of five seats or less may abut a tunnel at one side and an aisle at the other side.

The number of banks of seats on the "main floor" shall not exceed fifteen unless an intervening or cross aisle is provided between each fifteen banks of seats or a direct exit is provided for each aisle.

The number of banks of seats in the "balcony" shall not exceed nine unless an intervening or cross aisle is provided between each nine banks of seats or a direct exit is provided for each aisle.

There shall be no more than eleven feet rise, measured vertically, in any aisle in any gallery without a direct exit by tunnel or otherwise to a corridor with free opening onto the gallery stairs, or other direct discharge to the street or at the said elevation of eleven feet an intervening or cross aisle leading directly to an exit. No tunnel shall be less than three feet wide in the clear. (The following paragraph begins "No foyer.")

Sec. 35, page 128. After paragraph two insert the following in place of paragraphs 3, 4, 5 and 6:

If such emergency exits lead outside the building, the openings leading thereto shall have metal frames filled with wire glass doors opening outward, hung from the inside corner of the jambs, and so constructed as not to project, when opened, beyond the outside face of the wall and outer shutters shall not be permitted.

Wherever any such emergency stairway passes over an exit door or window or other opening, said stairway shall be completely enclosed for a space of five feet greater in width than said opening, by iron, steel or other incombustible material.

All such emergency exits and stairways shall land at the ground level in a public thoroughfare or in some space that connects directly with a street or alley, and direct and immediate exit to such public thoroughfare shall not be obstructed by any door, gate, bars or other obstruction of any character.

Every court in which there shall be an emergency stairway shall have direct and unobstructed access along the surface of the ground to a street, alley or yard opening into an alley or street without entering into or passing through or over any building unless by a four-foot wide fireproof passage on the court or ground level.

Sec. 37, page 128. Insert in place of third paragraph the following:

No scenery shall be used upon the stage unless such scenery shall have been treated with a paint or chemical solution which shall make it non-combustible and which shall be approved by the Fire Marshal. Or if such scenery is already treated

with a paint or chemical solution designed to make it non-combustible, it shall not be used upon the stage of any such building until the Fire Marshal, after a sufficient test of such scenery, has approved it as being non-combustible.

Sec. 39, page 128. Strike out the first three paragraphs and read the following:
Vents—Size of— Flue Pipes—Dampers—Switches for Dampers.—One or more vents or flue pipes of metal construction, or other non-combustible material, suitable for carrying away smoke, and approved by the Commissioner of Buildings, and extending not less than fifteen (15) feet above the highest point of the roof, and equivalent in area to one-twentieth of the area of the stage shall be built over the stage.

In buildings where additional stories are built above the stage, said vents or flue pipes may be carried out near the top of the stage walls and shall be continued and run up on the exterior of the building to a point five feet above the highest point of the additional stories.

All such flues or vents shall be provided with metal dampers, and shall be opened by a closed circuit battery suitable to and approved by the City Electrician.

Sec. 40, page 129. In second paragraph omit "above and below the stage, elevator shafts and passageways."

Sec. 46, page 130. Add "City Electrician" after Fire Marshal.

Sec. 43, page 130. Insert City Electrician in place of Commissioner of Buildings.

Add to Section 141 of building ordinance the words:

"And all doors of buildings leading to any street, alley or other public way shall swing outwards on hinges and no entrance or exit of any building leading to any such street, alley or public way shall be obstructed by any revolving door or doors, or other contrivances obstructing the free and speedy ingress or egress, through or by said entrance, or exit to and from any such building to the street, alley or public way."

As amended July 14, 1904.

SEND FOR CATALOGUE.

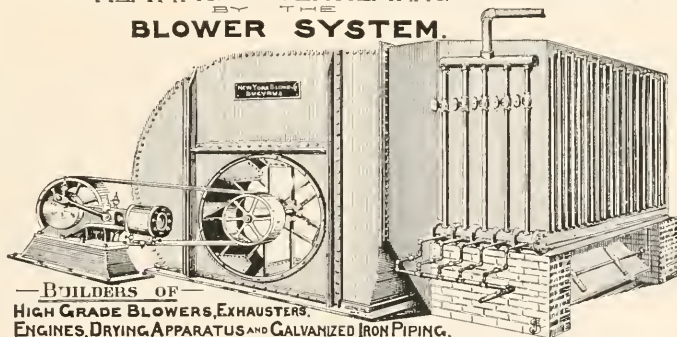
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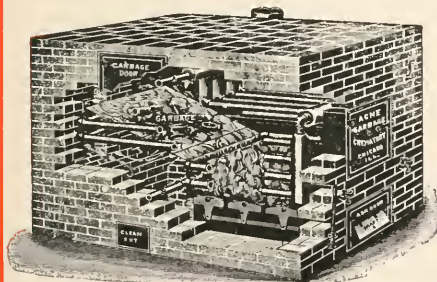
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International System, S. M. Randolph, 217, 134 Washington St. Jackson & Corbett Bridge & Steel Works, 1132 to 1140 The Rookery. McEvoy, Wm. P. & Co., 414 Reaper Block. McNulty Bros., Railway Exchange Bldg. Roebbing Construction Co., The, 906 Tribune Bldg. Simpson Construction Co., 704 Cham. of Com.

CONCRETE FIRE PROOFING.

Expanded Metal Fire Proofing Co., 790 Old Colony Bldg. International System, S. M. Randolph, 217, 134 Washington St. Roebbing Construction Co., The, 906 Tribune Bldg.

CONDUCTOR PIPE.

Illinois Roofing & Supply Co., 23 E. Lake St.

CONSOLES AND MANTELS.

Dawson Bros., 197-207 N. Halsted St. Elman, C. & Co., 1201 W. Superior St. Interior Woodworking Co., 296 Wabash Av.

CONTRACTORS AND BUILDERS.

Angus Bros. & Co., Security Bldg. Bailey & Andrews, 411, 115 Dearborn St. Chicago Bridge & Iron Works, Throop and 105th Sts. Clark, C. Everett Co., 1015, 100 Washington St. Cullen, Frank J., 617 Chamber of Commerce. Davis, Reginald J. Co., The, Suite 1451, Railway Exchange Bldg. Dick, John, 219 Chamber of Commerce. Ellenberger & Meiling, 84 La Salle St. Edmunds Mfg. Co., Robey St. & Washburn Av. Falkenau Construction Co., 110 La Salle St. Freeman, Hart & Co., Builders & Traders Exc. Grace, Wm. Company, 1408 Wabash Av. Garthwait, F. M., 318 Chamber of Commerce. Gindele, Chas. W., Co., 3333 La Salle St. Griffiths, John & Son, 1009-1011 Merchants Loan & Trust Bldg. Heyworth, James O., Railway Exchange Bldg. Johnson, F. O., 938 Thome Av. Langst, A., 716-717 Chamber of Commerce. Leafgreen Bros., 614 Chamber of Commerce. Ledgerwood, A. J. C., Rooms 516-517, 184 La Salle St. Mayor, William Co., 167 Dearborn St.

McCarthy Brothers, 804, 134 Monroe St.
 Morava Construction Co., 1243 Marquette Bldg.
 Morrice & Barron, 125 La Salle St.
 Moe, Ingwald, 7627 Coles Av.
 Moulton, Geo. M. & Co., Fisher Bldg.
 Mueller, Paul P. F., 109 Randolph St.
 Morthner & Tapper, 184 La Salle St.
 Nelson, F. P. & Son, 715-716 Cham. of Com.
 Peterson, John & Co., Room 32, 122 La Salle St.
 Rodatz, Jacob, The Rookery.
 Scharner, Jacob, 1007 Chamber of Commerce.
 Schlueter, Henry W., 204 Dearborn St.
 Snyder, J. W., 316, 145 La Salle St.
 Sollitt, Ralph & Sumner Co., 140 Dearborn St.
 Sproul, Elliott W., 312 Chamber of Commerce.
 Strandberg, E. P. Company, 159 La Salle St.
 Strosenreuter Bros., Chamber of Commerce.
 Thompson-Starrett Co., Railway Exc. Bldg.
 Thomson, George & Son Co., 145 La Salle St.
 Truesdell, F. H., 4360 N. Clark St.
 Wells Bros. Company, 1014 Monadnock Blk.
 Wolfinger, Clarence L., 164 La Salle St.

CONTRACTORS—STEAM HOISTS.

Shaw, Willis, 312, 171 La Salle St.

CONVEYORS—SPIRAL STEEL.

Brown Hoisting Machinery Co., The, Cleveland, Ohio.
 Jeffrey Mfg. Co., Monadnock Bldg., and Columbus, Ohio.
 Link Belt Machinery Co., 39th St. and Stewart Av.
 Webster Mfg. Co., 1075 W. 15th St.

COOLING SYSTEMS FOR BUILDINGS.

Thomas & Smith, 17-19 S. Carpenter St.

COPING.

Northwestern Terra Cotta Co., The, 1415 Railway Exchange Bldg.

COPPER ORNAMENTS.

Friedley & Voshardt 194-202 Mather St.

COPPER—SHEET.

Benedict & Burnham Brass & Copper Co., 167 Lake St.

CORNICE MAKERS' ORNAMENTS.

Friedley & Voshardt 194-202 Mather St.
 Knisely Co., Harry C., 273 S. Canal St.

CORNICE WORK.

Bremer & Bielenberg, 1136 W. 13th St.
 Knisely Bros., 28th Place and 5th Av.
 Knisely Co., Harry C., 273 S. Canal St.
 McFarland, J. C. & Co., 27th St. and 5th Av.
 Sykes Steel Roofing Co., 611 S. Morgan St.
 Yeldham & Keusder, 269 W. Van Buren St.

CORNICES—COPPER, GALVANIZED.

Bremer & Bielenberg, 1136 W. 13th St.
 Knisely Bros., 28th Place and 5th Av.
 Knisely Co., Harry C., 273 S. Canal St.
 Miller, James A. & Bro., 129 S. Clinton St.
 McFarland, J. C. & Co., 27th St. and 5th Av.
 Sykes Steel Roofing Co., 611 S. Morgan St.
 Yeldham & Keusder, 269 W. Van Buren St.

CORNICE FINIALS.

Illinois Roofing & Supply Co., 23 E. Lake St.

CORRUGATED IRON.

Bremer & Bielenberg, 1136 W. 13th St.
 Knisely Bros., 28th Place and 5th Av.
 Lloyd Iron Roofing & Paint Co., The, 99-101 W. Monroe St.
 Miller, James A. & Bro., 129 S. Clinton St.
 McFarland, J. C. & Co., 27th St. and 5th Av.
 Ryerson, Joseph T. & Son, 18-22 Milwaukee Av.
 Sykes Steel Roofing Co., 611 S. Morgan St.
 Yeldham & Keusder, 269 W. Van Buren St.

COTTON TWINES.

Samson Cordage Works, 115 Congress St., Boston, Mass.

CRANES—TRAVELING.

Shaw, Willis, 312, 171 La Salle St.

CRUSHED STONE DEALERS.

Producers' Supply Co., 418 Cham. of Com.

CURBING—OOLITIC LIME STONE.

Belford Quarries Co., The, Room 638, 204 Dearborn St.

CUT STONE CONTRACTORS.

Buscher & Gast, 3333 N. Clark St.
 Chicago Cut Stone Co., 3403 La Salle St.
 Edwards & Ward, Fullerton Av. Bridge.
 Rawle, John 507 Chamber of Commerce.

CUTLERY AND TOOLS.

Hodge & Homer Co., 47 and 49 W. Randolph.
 Orr & Lockett Hardware Co., 71-73 Randolph.
 Stebbins Hardware Co., 74 Van Buren St.

DAMP COURSES.

Bird, F. W. & Son, 1434 Monadnock Blk.
 Blome, Rudolph S. Co., 79 Dearborn St.
 Watson, H. F. Co., 12-14 S. Clinton St.

DEADENING FELT—QUILT.

Johns-Manville Co., H. W., 173 Randolph St.
 Watson, H. F. Co., 12-14 S. Clinton St.

DEADENING MATERIAL.

Maekolite Fireproofing Co., 1401-03 Schiller Bldg.

DECORATORS.

Brand, Gustave A. & Co., 31 E. Washington St.
 Eckart, Wm. Company, 335 Wabash Av.
 Mitchell & Halbach, 264 Michigan Av.
 Spierling & Linden, 1216 Michigan Av.

DECORATORS—THEATER.

Spierling & Linden, 1216 Michigan Av.
 Eckart, Wm. Company, 335 Wabash Av.
 Mitchell & Halbach, 264 Michigan Av.

DOORS.

Chicago Veneered Door Co., 316 Chamber of Commerce Bldg.
 Paine Lumber Co., Chamber of Commerce.

DOOR HANGERS.

Lane Bros. Company, Poughkeepsie, N. Y.

DOOR HANGERS—BALL BEARING.

Lane Bros. Company, Poughkeepsie, N. Y.

DOORS—CROSS HORIZONTAL FOLDING.

Variety Mfg. Co., 77-83 W. Lake St.

DOORS—CROSS IMPROVED MEAKER.

Variety Mfg. Co., 77-83 W. Lake St.

DOORS—SLIDING SWING.

Dodge, H. B. & Co., 525, 108 La Salle St.

DOORS—VENEERED.

Chicago Veneered Door Co., 316 Chamber of Commerce Bldg.

DRAINAGE.

Conlin, Thomas, Plumbing & Heating Co., 3978 Cottage Grove Av.
 Roche, James H., 210 31st St.
 Wills & Smith, 5338 S. Halsted St.

DRAIN TILE.

Dee, Wm. E., 214 and 215 Royal Ins. Bldg.

DRAWING MATERIALS.

Dietzgen, Eugene Co., 181 Monroe St.
 Keuffel & Esser Co., 111 Madison St.
 United States Blue Print Paper Co., 263 La Salle St.

DRY ROOMS.

Chicago Clothes Dryer Works, 346-348 Wabash Av.
 Kehm Bros. Company, 19 N. State St.
 Nelson & Krueger Co., Spalding Av. and Bloomington Road.
 Troy Laundry Machinery Co., 401 Fifth Av.

DYNAMOS.

Brown Electrical Construction Co., Ellsworth Bldg.
Chicago Edison Co., 139 Adams St.
Fairbanks, Morse & Co., Franklin and Monroe.
Frantzen, Arthur Company, 277 Dearborn St.
Freeman, Ernest Company, 112 Dearborn St.
Kohler Bros., 1804-1812 Fisher Bldg.
McFell Electric Co., 303 Dearborn St.
Wadeford Electric Co., 1726 Marquette Bldg.
Western Electric Co., 259 S. Clinton St.

EAVES AND TROUGHS.

Illinois Roofing & Supply Co., 23 E. Lake St.

ELECTRIC LIGHT ENGINES.

Allis-Chalmers Company, Chicago.

ELECTRIC BELLS AND LIGHTING.

Brown Electrical Construction Co., Ellsworth Bldg.
Chicago Edison Co., 139 Adams St.
Frantzen, Arthur Company, 277 Dearborn St.
Freeman, Ernest Company, 112 Dearborn St.
McFell Electric Co., 303 Dearborn St.
Wadeford Electric Co., 1726 Marquette Bldg.
Western Electric Co., 259 S. Clinton St.

ELECTRICAL CONSTRUCTION.

Brown Electrical Construction Co., Ellsworth Bldg.
Chicago Edison Co., 139 Adams St.
Crockett, W. P., 211 Jackson Blvd.
Frantzen, Arthur Company, 277 Dearborn St.
Freeman, Ernest Company, 112 Dearborn St.
Kohler Bros., 1804-1812 Fisher Bldg.
McFell Electric Co., 303 Dearborn St.
Sweet, Frank Z., 277 Dearborn St.
Wadeford Electric Co., 1726 Marquette Bldg.
Western Electric Co., 259 S. Clinton St.

ELECTRIC ELEVATORS.

Eaton & Prince Co., 70-76 Michigan St.
Kaestner, Chas. & Co., 241-261 S. Jefferson St.
Otis Elevator Company, 159 La Salle St.
Reedy, J. W. Elevator Mfg. Co., 91 Illinois St.
Western Electric Co., 259 S. Clinton St.

ELECTRIC-ENCLOSED ARC LAMPS.

Jandus Electric Co., The, 1537 Monadnock Bldg.

ELECTRIC FANS—DESK AND CEILING.

Jandus Electric Co., The, 1537 Monadnock Bldg.

ELECTRIC FIXTURES.

Edwards, W. S. Mfg. Co., 21 E. Lake St.
McFell Electric Co., 303 Dearborn St.
Western Electric Co., 259 S. Clinton St.
Wingrave & Mac Naughtan Co., 189 Wabash.

ELECTRIC MOTORS.

Brown Electrical Construction Co., Ellsworth Bldg.
Chicago Edison Co., 139 Adams St.
Fairbanks, Morse & Co., Franklin and Monroe.
Frantzen, Arthur Company, 277 Dearborn St.
Freeman, Ernest Company, 112 Dearborn St.
Jandus Electric Co., The, 1537 Monadnock Bldg.
Kohler Bros., 1804-1812 Fisher Bldg.
McFell Electric Co., 303 Dearborn St.
Sweet, Frank Z., 277 Dearborn St.
Wadeford Electric Co., 1726 Marquette Bldg.
Western Electric Co., 259 S. Clinton St.

ELECTRIC SWITCHES.

Crockett, W. P., 211 Jackson Blvd.
Fairbanks, Morse & Co., Franklin and Monroe.
Western Electric Co., 259 S. Clinton St.

ELECTRICAL APPARATUS AND SUPPLIES.

Chicago Edison Co., 139 Adams St.
Crockett, W. P., 211 Jackson Blvd.
Freeman, Ernest Company, 112 Dearborn St.
Kohler Bros., 1804-1812 Fisher Bldg.
McFell Electric Co., 303 Dearborn St.
Sweet, Frank Z., 277 Dearborn St.
Wadeford Electric Co., 1726 Marquette Bldg.
Western Electric Co., 259 S. Clinton St.

ELECTRICAL FUSES.

Johns-Manville Co., H. W., 173 Randolph St.

ELEVATING AND CONVEYING MACHINERY.

Brown Hoisting Machinery Co., The, Cleveland, Ohio.
Jeffrey Mfg. Co., Monadnock Bldg., and Columbus, Ohio.
Link Belt Machinery Co., 39th St. and Stewart Av.
Moore & Lorenz, 113-123 S. Clinton St.
Webster Mfg. Co., 1075 W. 15th St.

ELEVATOR BUCKETS.

Moore & Lorenz, 113-123 S. Clinton St.

ELEVATOR DOORS AND ENCLOSURES.

American Iron & Wire Wks., 575-581 Carroll Av.
Booth, John, 14 and 16 N. Canal St.
Chicago Ornamental Iron Works, 37th St. and Stewart Av.
Halsted, Joseph, 388 W. Randolph St.
Hickey, M. H. Wire & Iron Works, 54 Dearborn St.
Landon & Eggers Iron & Wire Works, Contracting Office First National Bank Bldg.
Smith, F. P. Wire & Iron Works, 100 Lake St.
Standard Company, The, 15th & Laflin Sts.
Union Foundry Works, First Nat'l Bank Bldg.
Voss, Frederick, 617 to 621 Austin Av.
Winslow Bros. Company, The, 368-408 Carroll Av.

ELEVATOR ELECTRIC SIGNALS.

Elevator Supply & Repair Co., 36 W. Monroe.

ELEVATOR FIRE DOORS.

Hickey, M. H. Wire & Iron Works, 54 Dearborn St.
Kinneear Mfg. Co., The, 112 Clark St.
Standard Company, The, 15th & Laflin Sts.

ELEVATOR FLOOR INDICATORS.

Eaton & Prince Co., 70-76 Michigan St.
Elevator Supply & Repair Co., 36 W. Monroe.
Standard Company, The, 15th & Laflin Sts.

ELEVATOR MACHINERY.

Eaton & Prince Co., 70-76 Michigan St.
Kaestner, Chas. & Co., 241-261 S. Jefferson St.
Otis Elevator Company, 159 La Salle St.
Winslow Bros. Company, The, 368-408 Carroll Av.

ELEVATOR REPAIRS.

Elevator Supply & Repair Co., 36 W. Monroe.
Kaestner, Chas. & Co., 241-261 S. Jefferson St.
Otis Elevator Company, 159 La Salle St.
Reedy, J. W. Elevator Mfg. Co., 91 Illinois St.

ELEVATORS—PASSENGER AND FREIGHT.

Eaton & Prince Co., 70-76 Michigan St.
Elevator Supply & Repair Co., 36 W. Monroe.
Kaestner, Chas. & Co., 241-261 S. Jefferson St.
Otis Elevator Company, 159 La Salle St.
Reedy, J. W. Elevator Mfg. Co., 91 Illinois St.
Winslow Bros. Company, The, 368-408 Carroll Av.

ENGINES.

Allis-Chalmers Company, Chicago.
Dawson, A. L. & Co., 27-29-31 W. Washington.
Fairbanks, Morse & Co., Franklin and Monroe.
Kaestner, Chas. & Co., 241-261 S. Jefferson St.
National Meter Co., 318 Dearborn St.
Rider-Eriksen Engine Co., 40 Dearborn St.
Shaw, Willis, 312, 171 La Salle St.
Street, R. R. & Co., 184-186 Washington St.
Vilter Mfg. Co., The, Milwaukee, Wis., and Monadnock Bldg., Chicago.

ENGINES—CORLISS.

Allis-Chalmers Company, Chicago.
Street, R. R. & Co., 184-186 Washington St.
Vilter Mfg. Co., The, Milwaukee, Wis., and Monadnock Bldg., Chicago.

ENGINES—HOISTING.

Shaw, Willis, 312, 171 La Salle St.

EXAMELING STEEL.

American Sheet & Tin Plate Co., Pittsburg, Pa.; Rookery Bldg., Chicago; Battery Park Bldg., New York; Union Trust Bldg., Cincinnati; Ainsworth Bldg., Portland, Ore.; Henon Bldg., New Orleans; Equitable Bldg., Denver; Mills Bldg., San Francisco; Security Bldg., St. Louis.

ENGINE BEDS.

Blome, Rudolph S. Co., 79 Dearborn St. Chicago Cut Stone Co., 3403 La Salle St. Edwards & Ward, Fullerton Av. Bridge. Hoeffer & Co., Chamber of Commerce Bldg. Rawle, John 507 Chamber of Commerce. Simpson Construction Co., 704 Cham. of Com.

ENGINES—GAS.

Fairbanks, Morse & Co., Franklin and Monroe, National Meter Co., 318 Dearborn St. Webster Mfg. Co., 1075 W. 15th St.

ENGINEER AND CONTRACTOR FOR CENTRAL STATION HEATING PLANTS.

Schott, W. H., 1220-1221 Marquette Bldg.

ENGINEERS.

American Bureau of Inspection & Tests, The, 930 Monadnock Bldg. American Engineering Specialty Co., 1510 Monadnock Bldg. Hunt, Robert W. & Co., 1121 The Rookery. Vilter Mfg. Co., The, Milwaukee, Wis., and Monadnock Bldg., Chicago.

ENGINEERS—CONTRACTING.

American Engineering Specialty Co., 1510 Monadnock Bldg. Brown Electrical Construction Co., Ellsworth Bldg. Chicago Bridge & Iron Works, Throop and 105th Sts. Kohler Bros., 1804-1812 Fisher Bldg. Morava Construction Co., 1243 Marquette Bldg. Strobel, C. L., 1744-48 Monadnock Bldg. Sweet, Frank Z., 277 Dearborn St.

ENGINEERS—CIVIL.

Greeley-Howard Co., 822, 112 Clark St.

ENGINEERS—STRUCTURAL.

Chicago Bridge & Iron Works, Throop and 105th Sts. Morava Construction Co., 1243 Marquette Bldg.

EXHAUST FANS.

Andrews & Johnson Co., 256 Washington Bly. New York Blower Co., 25th Pl. & Stewart Av. Variety Mfg. Co., 77-83 W. Lake St.

EXPANDED METAL.

Imperial Expanded Metal Co., 1538 Monadnock Bldg. Northwestern Expanded Metal Co., Old Colony Bldg.

EXPANDED METAL LATH.

Expanded Metal Fire Proofing Co., 790 Old Colony Bldg. Imperial Expanded Metal Co., 1538 Monadnock Bldg. Northwestern Expanded Metal Co., Old Colony Bldg.

EXPANSION TANKS.

International Heater Co., 48 Dearborn St. Kroeschell Bros. Co., 55 Erie St.

FAN SYSTEM OF HEATING AND VENTILATING.

Andrews & Johnson Co., 256 Washington Bly. New York Blower Co., 25th Pl. & Stewart Av.

FEED WATER HEATERS.

American Engineering Specialty Co., 1510 Monadnock Bldg. Clow, James B. & Sons, Harrison & Franklin. Davies Warehouse & Supply Co., 20 N. Clark. Dawson, A. L. & Co., 27-29-31 W. Washington.

FENCING AND WINDOW GUARDS.

Northwestern Expanded Metal Co., Old Colony Bldg.

FERRO CEMENT CONSTRUCTION.

Blome, Rudolph S. Co., 79 Dearborn St. Hoeffer & Co., Chamber of Commerce Bldg. McEvoy, Wm. P. & Co., 414 Reaper Block. Simpson Construction Co., 704 Cham. of Com.

FILLER FOR CRACKS AND CREVICES.

San-Itai-Rie Crack and Crevice Filler Co., 2132-2134 Indiana Av.

FILTERS.

National Filter Company, Dearborn, Van Buren Sts. and Custom House Ct. New York Continental Jewell Filtration Co., 40-42 Quincy St.

FIRE BRICK AND CLAY.

Chicago Fire Brick Co., 518 Chamber of Commerce Bldg. Dee, Wm. E., 214 and 215 Royal Ins. Bldg. Garden City Sand Co., The, 188 Madison St. Jenkins & Reynolds Co., The, 1210 Cham. Com.

FIRE DOORS.

Smith, F. P. Wire & Iron Works, 100 Lake St. Variety Mfg. Co., 77-83 W. Lake St. Voss, Frederick, 617 to 621 Austin Av.

FIRE ESCAPES.

Benner Mfg. Co., 110 W. Monroe St. Booth, John, 14 and 16 N. Canal St. Halsted, Joseph, 388 W. Randolph St. Hammill Fire Escape Co., Chamber of Com. Hickey, M. H. Wire & Iron Works, 54 Dearborn St. Landon & Eggers Iron & Wire Works, Contracting Office First National Bank Bldg. Muth, Chr., 428 Blue Island Av. Superior Iron Works, 141-143 Ontario St. Smith, F. P. Wire & Iron Works, 100 Lake St. Union Foundry Works, First Nat'l Bank Bldg. Voss, Frederick, 617 to 621 Austin Av.

FIREPLACE FURNISHINGS, ETC.

Hawes & Dodd, 24 Adams St.

FIREPROOF PAINTS—ANTI-FLAME.

Chicago Fire Proof Covering Co., 18 N. Canal St.

FIREPROOF LATH.

Northwestern Expanded Metal Co., Old Colony Bldg.

FIREPROOF PARTITIONS.

Chicago Fire Brick Co., 518 Chamber of Commerce Bldg. Expanded Metal Fire Proofing Co., 790 Old Colony Bldg. Illinois Terra Cotta Lumber Co., 461 The Rookery. International System, S. M. Randolph, 217, 124 Washington St. Mackolite Fireproofing Co., 1401-03 Schiller Bldg. National Fire Proofing Co., 85 Hartford Bldg. Pioneer Fireproofing Co., 1515 Marquette Bldg. Roebbing Construction Co., The, 906 Tribune Bldg. Voss, Frederick, 617 to 621 Austin Av.

FIREPROOF SASH AND FRAMES.

Bremer & Bielenberg, 1136 W. 13th St. Knisely Bros., 28th Place and 5th Av. Knisely Co., Harry C., 273 S. Canal St. Voigtman & Company, 42-54 E. Erie St. Yeldham & Kensder, 269 W. Van Buren St.

FIRE PROOF SHUTTERS AND DOORS.

Dodge, H. B. & Co., 525, 108 La Salle St. Kinnear Mfg. Co., The, 112 Clark St. Smith, F. P. Wire & Iron Works, 100 Lake St. Voss, Frederick, 617 to 621 Austin Av.

FIREPROOF WINDOWS.

Bremer & Bielenberg, 1136 W. 13th St.
Knisely Bros., 28th Place and 5th Av.
Knisely Co., Harry C., 273 S. Canal St.
Sykes Steel Roofing Co., 611 S. Morgan St.
Voigtman & Company, 42-54 E. Erie St.
Yeldham & Keusder, 269 W. Van Buren St.

FIREPROOF WIRE LATH.

Expanded Metal Fire Proofing Co., 790 Old Colony Bldg.
General Fireproofing Co., The, 212 Federal Bldg., Youngstown, Ohio.
Northwestern Expanded Metal Co., Old Colony Bldg.
Roebbing Construction Co., The, 906 Tribune Bldg.
Smith, F. J., Wire & Iron Works, 100 Lake St.
Voss, Frederick, 617 to 621 Austin Av.

FIRE PROOFING.

Chicago Fire Brick Co., 518 Chamber of Commerce Bldg.
General Fireproofing Co., The, 212 Federal Bldg., Youngstown, Ohio.
Illinois Terra Cotta Lumber Co., 461 The Rookery.
International System, S. M. Randolph, 217, 134 Washington St.
Mackolite Fireproofing Co., 1401-03 Schiller Bldg.
National Fire Proofing Co., 85 Hartford Bldg.
Pioneer Fireproofing Co., 1515 Marquette Bldg.
Roebbing Construction Co., The, 906 Tribune Bldg.

FIRE WINDOWS.

Knisely Bros., 28th Place and 5th Av.
Knisely Co., Harry C., 273 S. Canal St.
Sykes Steel Roofing Co., 611 S. Morgan St.
Yeldham & Keusder, 269 W. Van Buren St.

FLOOR AND ROOF LIGHTS.

Brown Bros. Mfg. Co., 22nd and Campbell Av.

FLOORING—FACTORY.

Ensign Lumber Co., The Dexter Bldg., 84 Adams St.

FLOORING—HARDWOOD.

Chandler Lumber Company, 100 Elston Av.
Rittenhouse & Embree Co., 3500 Center Av.
Spry, John Lumber Co., Ashland Av. & 22d St.
Wilce, T. Co., The, 22nd and Throop St.

FLOORING—WOOD BLOCK.

Dodge, H. B. & Co., 525, 108 La Salle St.

FLUE LININGS.

Dee, Wm. E., 214 and 215 Royal Ins. Bldg.
Garden City Sand Co., The, 188 Madison St.

FORGINGS.

American Bridge Co., 1315 Monadnock.
Jackson & Corbett Bridge & Steel Works, 1132 to 1140 The Rookery.
Keenwood Bridge Co., First Nat'l Bank Bldg.

FOUNDERS.

Allis-Chalmers Company, Chicago.
Brown Hoisting Machinery Co., The, Cleveland, Ohio.
Jeffrey Mfg. Co., Monadnock Bldg., and Columbus, Ohio.
Link Belt Machinery Co., 39th St. and Stewart Av.
Webster Mfg. Co., 1075 W. 15th St.

FRAMES—WINDOW & DOOR.

Paine Lumber Co., Chamber of Commerce.
Russell, P. A., 1131-1133 School St.

FRICTION CLUTCHES.

Brown Hoisting Machinery Co., The, Cleveland, Ohio.
Jeffrey Mfg. Co., Monadnock Bldg., and Columbus, Ohio.
Kaestner, Chas. & Co., 241-261 S. Jefferson St.
Link Belt Machinery Co., 39th St. and Stewart Av.
Webster Mfg. Co., 1075 W. 15th St.

FURNACES.

International Heater Co., 48 Dearborn St.
Lewis & Kitchen, 433 Wabash Av.

FURNACE BUILDERS.

Baldwin, M. E., 1651 Marquette Bldg.

FURNITURE—STEEL.

General Fireproofing Co., The, 212 Federal Bldg., Youngstown, Ohio.

GALVANIZED AND BLACK SHEETS.

Illinois Roofing & Supply Co., 23 E. Lake St.

GALVANIZED IRON.

Bremer & Bielenberg, 1136 W. 13th St.
Knisely Bros., 28th Place and 5th Av.
Yeldham & Keusder, 269 W. Van Buren St.

GARBAGE CREMATORIES AND WATER HEATERS.

Acme Garbage Crematory & Heater Co., 84 La Salle St.

GARBAGE CREMATORIES.

Acme Garbage Crematory & Heater Co., 84 La Salle St.

GAS BROILERS.

Detroit Stove Works, 2921 to 2933 S. La Salle St., Chicago, Ill.

GAS ENGINES.

National Meter Co., 318 Dearborn St.

GAS FITTING.

Conlin, Thomas, Plumbing & Heating Co., 3978 Cottage Grove Av.

GAS FIXTURES.

Edwards, W. S. Mfg. Co., 21 E. Lake St.
Wingrave & Mac Naughtan Co., 180 Wabash.

GAS—ILLUMINATING.

People's Gas Light & Coke Co., Michigan Av. and Adams St.

GAS LOGS AND GAS GRATES FOR FIRE-PLACES.

Dawson Bros., 197-207 N. Halsted St.

GAS MACHINES.

Johnson Temperature Controlling Co., 154 Lake St.

GAS—NATURAL.

People's Gas Light & Coke Co., Michigan Av. and Adams St.

GAS RANGES.

Detroit Stove Works, 2921 to 2933 S. La Salle St., Chicago, Ill.

GAS STEAM RADIATORS.

Clow, James B. & Sons, Harrison & Franklin.

GAS WATER HEATERS.

Detroit Stove Works, 2921 to 2933 S. La Salle St., Chicago, Ill.

GENERAL CONTRACTORS.

Angus Bros. & Co., Security Bldg.
Bulley & Andrews, 411, 115 Dearborn St.
Chicago Bridge & Iron Works, Throop and 105th Sts.
Clark, C. Everett Co., 1015, 100 Washington St.
Cullen, Frank J., 617 Chamber of Commerce.
Dick, John, 219 Chamber of Commerce.
Durlacher & MacLachlan, 416, 145 La Salle St.
Eilenberger & Meiling, 84 La Salle St.
Edmunds Mfg. Co., Robey St. & Washburn Av.
Falkenan Construction Co., 110 La Salle St.
Freeman, Hart & Co., Builders & Traders Exc., Grace, Wm. Company, 1408 Wabash Av.
Garthwait, F. M., 378 Chamber of Commerce.
Gindele, Chas. W., Co., 3333 La Salle St.
Griffiths, John & Son, 1009-1011 Merchants Loan & Trust Bldg.

Heyworth, James O., Railway Exchange Bldg.
Johnson, F. O., 938 Thome Av.
Langquist, A., 716-717 Chamber of Commerce.
Leafgreen Bros., 614 Chamber of Commerce.
Ledgerwood, A. J. C., Rooms 516-517, 184
La Salle St.
Mavor, William Co., 167 Dearborn St.
McCarty Brothers, 804, 134 Monroe St.
Morava Construction Co., 1243 Marquette Bldg.
Morrice & Barron, 125 La Salle St.
Moe, Ingwald, 7627 Coles Av.
Moulton, Geo. M. & Co., Fisher Bldg.
Mueller, Paul P. F., 169 Randolph St.
Mortimer & Tapper, 184 La Salle St.
Nelson, F. P. & Son, 715-716 Cham. of Com.
Peterson, John & Co., Room 32, 122 La Salle St.
Rodatz, Jacob, The Rookery.
Scharner, Jacob, 1007 Chamber of Commerce.
Schlueter, Henry W., 204 Dearborn St.
Snyder, J. W., 316, 145 La Salle St.
Solitt, Ralph & Sumner Co., 140 Dearborn St.
Sproul, Elliott W., 312 Chamber of Commerce.
Strandberg, E. P. Company, 159 La Salle St.
Stresenreuter Bros., Chamber of Commerce.
Thompson-Starrett Co., Railway Exe. Bldg.
Thomson, George & Son Co., 145 La Salle St.,
Room 819.
Truesdell, F. H., 4360 N. Clark St.
Wells Bros. Company, 1014 Monadnock Bldg.
Wolfinger, Clarence I., 164 La Salle St.

GENERAL HARDWARE.

Hodge & Homer Co., 47 and 49 W. Randolph.

GLASS.

American Luxfer Prism Co., 346 Wabash Av.
Tyler & Hippach, 88 Randolph St.

GLASS—ART, ORNAMENTAL AND STAINED.

American Luxfer Prism Co., 346 Wabash Av.
Helmerich, W. H. & Co., 151-153 Fulton St.
Linden Glass Co., 1216 Michigan Av.
Schuler & Mueller, Madison and Canal Sts.
Tyler & Hippach, 88 Randolph St.

GLASS—BEVELED.

American Luxfer Prism Co., 346 Wabash Av.
Helmerich, W. H. & Co., 151-153 Fulton St.
Schuler & Mueller, Madison and Canal Sts.

GLASS—CUT.

Helmerich, W. H. & Co., 151-153 Fulton St.
Schuler & Mueller, Madison and Canal Sts.

GLASS—MOSAIC.

Helmerich, W. H. & Co., 151-153 Fulton St.
Linden Glass Co., 1216 Michigan Av.
Schuler & Mueller, Madison and Canal Sts.

GLASS—PLATE.

Tyler & Hippach, 88 Randolph St.

GLASS—PLATE AND WINDOW.

Tyler & Hippach, 88 Randolph St.

GLASS—PRISMATIC.

American Luxfer Prism Co., 346 Wabash Av.
Helmerich, W. H. & Co., 151-153 Fulton St.

GLASS—WIRE.

Mississippi Wire Glass Co., 1212 Tribune Bldg.

GRAIN ELEVATOR MACHINERY.

Brown Hoisting Machinery Co., The, Cleve-
land, Ohio.
Chicago Bridge & Iron Works, Throop and
105th Sts.
Jeffrey Mfg. Co., Monadnock Bldg., and Colum-
bus, Ohio.
Kaestner, Chas. & Co., 241-261 S. Jefferson St.
Link Belt Machinery Co., 39th St. and Stew-
art Av.
Webster Mfg. Co., 1075 W. 15th St.

GRAIN ELEVATOR CONSTRUCTION.

Chicago Bridge & Iron Works, Throop and
105th Sts.

GRAIN ELEVATORS—ARCHITECTS AND CONTRACTORS.

Moulton, Geo. M. & Co., Fisher Bldg.

GRANITE.

Edwards & Ward, Fullerton Av. Bridge.

GRATES.

Interior Woodworking Co., 296 Wabash Av.

GRATES FOR FIREPLACES.

Dawson Bros., 197-207 N. Halsted St.
Hawes & Dodd, 24 Adams St.
Interior Woodworking Co., 296 Wabash Av.

GRAVEL.

Knickerbocker Ice Co., 171 La Salle St.

GRILLES.

Architectural Decorating Co., 204 Illinois St.
Decorators' Supply Co., The, 215 S. Clinton St.
DeVries, S. J. & Co., 47th St. near Halsted St.
Pagels, George, Loomis, Bet. 21st St. & 21st Pl.

GRILLE WORK—METAL.

Chicago Ornamental Iron Works, 37th St. and
Stewart Av.
Smith, F. P. Wire & Iron Works, 100 Lake St.
Standard Company, The, 15th & Laflin Sts.

GRIND STONES.

Cleveland Stone Co., 204 Dearborn St.

HAIR FELT.

Chicago Fire Proof Covering Co., 18 N. Canal St.
Johns-Manville Co., H. W., 173 Randolph St.

HANGERS—JOIST.

Columbian Hardware Co., The, 83 Michigan Av.

HANGERS AND SHAFING.

Street, R. R. & Co., 184-186 Washington St.

HARDWARE.

Columbian Hardware Co., The, 83 Michigan Av.
Orr & Lockett Hardware Co., 71-73 Randolph.

HARDWARE—BUILDERS'.

Chicago Hardware Co., 40 Dearborn St.
Orr & Lockett Hardware Co., 71-73 Randolph.

HARDWARE—MANUFACTURERS'.

Chicago Hardware Co., 40 Dearborn St.
Columbian Hardware Co., The, 83 Michigan Av.
Reading Hardware Co., 105 Lake St.

HARDWARE SPECIALTIES.

Chicago Hardware Co., 40 Dearborn St.
Columbian Hardware Co., The, 83 Michigan Av.
Reading Hardware Co., 105 Lake St.

HARDWOOD FLOORS.

Dunfee, J. & Co., 55 N. Claremont Av.

HARDWOOD FLOORING.

Chandler Lumber Company, 100 Elston Av.
Rittenhouse & Embree Co., 3500 Center Av.
Spry, John Lumber Co., Ashland Av. & 22d St.
Wilce, T. Co., The, 22nd and Throop St.

HARDWOOD LUMBER.

Chandler Lumber Company, 100 Elston Av.
Rittenhouse & Embree Co., 3500 Center Av.
Spry, John Lumber Co., Ashland Av. & 22d St.
Wilce, T. Co., The, 22nd and Throop St.

HEAT REGULATION.

Johnson Temperature Controlling Co., 154
Lake St.
Powers Regulator Co., The, 40 Dearborn St.

HEATERS.

Street, R. R. & Co., 184-186 Washington St.

HEATERS—COMBINATION.

International Heater Co., 48 Dearborn St.

HEATING APPARATUS.

American Engineering Specialty Co., 1510 Monadnock Blk.
Crane, M. H. Estate, 609 Security Bldg.
Clow, James B. & Sons, Harrison & Franklin.
Davies Warehouse & Supply Co., 20 N. Clark.
Davis Construction Co., 41 Dearborn St.
Deppmann, A. & Co., 212 Illinois St.
Douglas, Thos. J. & Co., 52 Dearborn St.
Graves, W. B., 45 E. Lake St.
Humphrey Co., Kalamazoo, Mich.
International Heater Co., 48 Dearborn St.
Instantaneous Water Heating Co., 153 S. Jefferson St.
Kewanee Boiler Company, 167 Lake St.
Kroeschell Bros. Co., 55 Erie St.
Lewis & Kitchen, 433 Wabash Av.
Norton, F. J., 8 North State St.
Phillips-Getschow Co., 184 Indiana St.
Pope, William A., 79 Lake St.
Simmons, C. H., 218 La Salle St.
Thomas & Smith, 17-19 S. Carpenter St.
Wilks, S. Mfg. Co., 35th St. & Shields Av.

HEATING SUPPLIES.

Crane, M. H. Estate, 609 Security Bldg.
Clow, James B. & Sons, Harrison & Franklin.
Davies Warehouse & Supply Co., 20 N. Clark.
Davis, G. M. Regulator Co., 144-146 Milwaukee Av.
Davis Construction Co., 41 Dearborn St.
International Heater Co., 48 Dearborn St.
Kehm Bros. Company, 19 N. State St.
Kewanee Boiler Company, 167 Lake St.
Kroeschell Bros. Co., 55 Erie St.
Phillips-Getschow Co., 184 Indiana St.
Wilks, S. Mfg. Co., 35th St. & Shields Av.

HEATING AND VENTILATING—ENGINEERS.

Andrews & Johnson Co., 256 Washington Blv.
Crane, M. H. Estate, 609 Security Bldg.
New York Blower Co., 25th Pl. & Stewart Av.

HEATING AND VENTILATING.

American Engineering Specialty Co., 1510 Monadnock Blk.
Andrews & Johnson Co., 256 Washington Blv.
Arcade Steam Heating Co., 70 La Salle Av.
Crane, M. H. Estate, 609 Security Bldg.
Conlin, Thomas, Plumbing & Heating Co., 3978 Cottage Grove Av.
Davis Construction Co., 41 Dearborn St.
Dilzer, Fred, 48 Dearborn St.
Douglas, Thos. J. & Co., 52 Dearborn St.
Graves, W. B., 45 E. Lake St.
Ideal Heating Company, 414 W. 63rd St.
Kirk, Geo. H., 5319 Wentworth Av.
Kroeschell Bros. Co., 55 Erie St.
Lewis & Kitchen, 433 Wabash Av.
New York Blower Co., 25th Pl. & Stewart Av.
Norton, F. J., 8 North State St.
Phillips-Getschow Co., 184 Indiana St.
Pope, William A., 79 Lake St.
Prentice, L. H. Company, 24-26 Sherman St.
Sykes Steel Roofing Co., 611 S. Morgan St.
Simmons, C. H., 218 La Salle St.
Thomas & Smith, 17-19 S. Carpenter St.

HECTOGRAPH PRINTS.

United States Blue Print Paper Co., 263 La Salle St.

HOT BLAST HEATING APPARATUS.

American Engineering Specialty Co., 1510 Monadnock Blk.
Andrews & Johnson Co., 256 Washington Blv.
Arcade Steam Heating Co., 70 La Salle Av.
Davis, G. M. Regulator Co., 144-146 Milwaukee Av.
Deppmann, A. & Co., 212 Illinois St.
Kehm Bros. Company, 19 N. State St.
New York Blower Co., 25th Pl. & Stewart Av.
Prentice, L. H. Company, 24-26 Sherman St.

HOT WATER HEATERS.

American Engineering Specialty Co., 1510 Monadnock Blk.
Arcade Steam Heating Co., 70 La Salle Av.
Clow, James B. & Sons, Harrison & Franklin.
Davies Warehouse & Supply Co., 20 N. Clark.

Davis Construction Co., 41 Dearborn St.
Dilzer, Fred, 48 Dearborn St.
Douglas, Thos. J. & Co., 52 Dearborn St.
International Heater Co., 48 Dearborn St.
Kewanee Boiler Company, 167 Lake St.
Kroeschell Bros. Co., 55 Erie St.
Lewis & Kitchen, 433 Wabash Av.
Phillips-Getschow Co., 184 Indiana St.
Thomas & Smith, 17-19 S. Carpenter St.
Wilks, S. Mfg. Co., 35th St. & Shields Av.

HOT WATER AND STEAM HEATING.

Arcade Steam Heating Co., 70 La Salle Av.
Conlin, Thomas, Plumbing & Heating Co., 3978 Cottage Grove Av.
Crane, M. H. Estate, 609 Security Bldg.
Clow, James B. & Sons, Harrison & Franklin.
Davies Warehouse & Supply Co., 20 N. Clark.
Deppmann, A. & Co., 212 Illinois St.
Dilzer, Fred, 48 Dearborn St.
Douglas, Thos. J. & Co., 52 Dearborn St.
Graves, W. B., 45 E. Lake St.
Ideal Heating Company, 414 W. 63rd St.
Kehm Bros. Company, 19 N. State St.
Kirk, Geo. H., 5319 Wentworth Av.
Kroeschell Bros. Co., 55 Erie St.
Lewis & Kitchen, 433 Wabash Av.
Nacey, P. Co., 315-317 Wabash Av.
Norton, F. J., 8 North State St.
Phillips-Getschow Co., 184 Indiana St.
Pope, William A., 79 Lake St.
Prentice, L. H. Company, 24-26 Sherman St.
Roche, James H., 210 31st St.
Simmons, C. H., 218 La Salle St.
Thomas & Smith, 17-19 S. Carpenter St.
Wills & Smith, 5938 S. Halsted St.

HOUSE MOVERS AND RAISERS.

Krueger Bros. & Company, 3616-18-20 S. Halsted.
Neuses, Michael, 3879 N. Clark St.
Sheeler, H., 715 Chamber of Commerce.

HYDRAULIC ELEVATORS.

Eaton & Prince Co., 70-76 Michigan St.
Otis Elevator Company, 159 La Salle St.
Reedy, J. W. Elevator Mfg. Co., 91 Illinois St.

HYGIENIC KALSOMINE.

Rubber Paint Company, 154-156 W. Van Buren.

ICE FACTORY AND REFRIGERATING PLANT SUPPLIES.

Vilter Mfg. Co., The, Milwaukee, Wis., and Monadnock Blk., Chicago.
Westerlin & Campbell Construction Co., 53-55 S. Clinton St.
Wolf, Fred W. Co., The, 139 Rees St.

ICE MAKING MACHINERY.

Vilter Mfg. Co., The, Milwaukee, Wis., and Monadnock Blk., Chicago.
Wolf, Fred W. Co., The, 139 Rees St.

ICE MAKING AND REFRIGERATING MACHINERY.

Vilter Mfg. Co., The, Milwaukee, Wis., and Monadnock Blk., Chicago.
Westerlin & Campbell Construction Co., 53-55 S. Clinton St.
Wolf, Fred W. Co., The, 139 Rees St.

INDUCED DRAFT REGULATORS.

Davis, G. M. Regulator Co., 144-146 Milwaukee Av.

INSPECTORS.

American Bureau of Inspection & Tests, The, 930 Monadnock Blk.
Hunt, Robert W. & Co., 1121 The Rookery.

INSTANTANEOUS WATER HEATERS—FOR BATHS—GAS OR GASOLINE.

Humphrey Co., Kalamazoo, Mich.
Instantaneous Water Heating Co., 153 S. Jefferson St.

INSULATING PAPERS.

Western Roofing & Supply Co., 177 Randolph.

INSULATION-BREWERIES AND COLD STORAGE WAREHOUSES.

Illinois Terra Cotta Lumber Co., 461 The Hookery.
National Fire Proofing Co., 85 Hartford Bldg.
Pioneer Fireproofing Co., 1515 Marquette Bldg.

INTERIOR DECORATORS.

Architectural Decorating Co., 204 Illinois St.
Brand, Gustave A. & Co., 31 E. Washington St.
Eckart, Wm. Company, 335 Wabash Av.
Mitchell & Halbach, 264 Michigan Av.
Spierling & Linden, 1216 Michigan Av.

INTERIOR FINISH.

Chicago Veneered Door Co., 316 Chamber of Commerce Bldg.
Davis, Reginald J. Co., The, Suite 1451, Railway Exchange Bldg.
Edmunds Mfg. Co., Robey St. & Washburn Av.
Harty Bros. & Harty Co., 444 W. 21st St.
Interior Woodworking Co., 296 Wabash Av.
Pagels, George, Loomis, Bet. 21st St. & 21st Pl.
Russell, P. A., 1131-1133 School St.
Union Interior Finish Co., 53d & La Salle Sts.
Wolinger, Clarence L., 164 La Salle St.

IRON DOORS AND SHUTTERS.

Benner Mfg. Co., 110 W. Monroe St.
Globe Iron Works, 31-41 Indiana St.
Halsted, Joseph, 388 W. Randolph St.
Hickey, M. H. Wire & Iron Works, 54 Dearborn St.
Horn, Wm. Structural Iron Works, 902 to 908 W. Lake St.
Kinneair Mfg. Co., The, 112 Clark St.
Lyon Metallic Mfg. Co., 18-20 S. Ann St.
Muth, Chr., 428 Blue Island Av.
Superior Iron Works, 141-143 Ontario St.
Smith, F. P. Wire & Iron Works, 100 Lake St.
Vanderpool Co., The, 497-505 W. 22nd St.
Voss, Frederick, 617 to 621 Austin Av.

IRON FOUNDRIES.

Reder Foundry Co., 181-189 Newberry Av.

IRON RAILINGS AND FENCES.

American Iron & Wire Wks, 575-581 Carroll Av.
Bolters, A. Sons, 84 La Salle St.
Booth, John, 14 and 16 N. Canal St.
Chicago Ornamental Iron Works, 37th St. and Stewart Av.
Globe Iron Works, 31-41 Indiana St.
Halsted, Joseph, 388 W. Randolph St.
Hickey, M. H. Wire & Iron Works, 54 Dearborn St.
Holmes, Pyott & Co., 13 N. Jefferson St.
Horn, Wm. Structural Iron Works, 902 to 908 W. Lake St.
Muth, Chr., 428 Blue Island Av.
Scaar, Frank & Co., 92-98 Eleventh St.
Smith, F. P. Wire & Iron Works, 100 Lake St.
South Halsted St. Iron Works, 135 Adams St.
Standard Company, The, 15th & Laflin Sts.
Steel Building & Construction Co., 911 N. Ashland Av.
Union Foundry Works, First Nat'l Bank Bldg.
Vanderpool Co., The, 497-505 W. 22nd St.
Voss, Frederick, 617 to 621 Austin Av.

IRON ROOFS.

Lloyd Iron Roofing & Paint Co., The, 99-101 W. Monroe St.
Morava Construction Co., 1243 Marquette Bldg.
Muth, Chr., 428 Blue Island Av.
Sykes Steel Roofing Co., 611 S. Morgan St.
Strobel, C. L., 1744-48 Monadnock Blk.

IRON STAIRS.

American Iron & Wire Wks, 575-581 Carroll Av.
Benner Mfg. Co., 110 W. Monroe St.
Brown Bros. Mfg. Co., 22nd and Campbell Av.
Chicago Ornamental Iron Works, 37th St. and Stewart Av.
Halsted, Joseph, 388 W. Randolph St.
Hickey, M. H. Wire & Iron Works, 54 Dearborn St.
Lyon Metallic Mfg. Co., 18-20 S. Ann St.
Muth, Chr., 428 Blue Island Av.
Superior Iron Works, 141-143 Ontario St.
Smith, F. P. Wire & Iron Works, 100 Lake St.

Standard Company, The, 15th & Laflin Sts.
Vanderpool Co., The, 497-505 W. 22nd St.
Voss, Frederick, 617 to 621 Austin Av.
Winslow Bros. Company, The, 368-408 Carroll Av.

IRON STORE FRONTS.

American Iron & Wire Wks, 575-581 Carroll Av.
Benner Mfg. Co., 110 W. Monroe St.
Brown Bros. Mfg. Co., 22nd and Campbell Av.
Chicago Ornamental Iron Works, 37th St. and Stewart Av.
Halsted, Joseph, 388 W. Randolph St.
Hickey, M. H. Wire & Iron Works, 54 Dearborn St.
Horn, Wm. Structural Iron Works, 902 to 908 W. Lake St.
Muth, Chr., 428 Blue Island Av.
Superior Iron Works, 141-143 Ontario St.
Smith, F. P. Wire & Iron Works, 100 Lake St.
Standard Company, The, 15th & Laflin Sts.
Vanderpool Co., The, 497-505 W. 22nd St.
Voss, Frederick, 617 to 621 Austin Av.
Winslow Bros. Company, The, 368-408 Carroll Av.

IRON WORK-ORNAMENTAL.

American Iron & Wire Wks, 575-581 Carroll Av.
Baldwin Brass Works, 252-234 S. Clinton St.
Benner Mfg. Co., 110 W. Monroe St.
Bolters, A. Sons, 84 La Salle St.
Booth, John, 14 and 16 N. Canal St.
Brown Bros. Mfg. Co., 22nd and Campbell Av.
Chicago Ornamental Iron Works, 37th St. and Stewart Av.
Columbian Hardware Co., The, 83 Michigan Av.
Globe Iron Works, 31-41 Indiana St.
Halsted, Joseph, 388 W. Randolph St.
Hickey, M. H. Wire & Iron Works, 54 Dearborn St.
Holmes, Pyott & Co., 13 N. Jefferson St.
Landon & Eggers Iron & Wire Works, Contracting Office First National Bank Bldg.
Luce, C. K., Chamber of Commerce.
Lyon Metallic Mfg. Co., 18-20 S. Ann St.
Muth, Chr., 428 Blue Island Av.
Scaar, Frank & Co., 92-98 Eleventh St.
Superior Iron Works, 141-143 Ontario St.
Smith, F. P. Wire & Iron Works, 100 Lake St.
South Halsted St. Iron Works, 135 Adams St.
Standard Company, The, 15th & Laflin Sts.
Union Foundry Works, First Nat'l Bank Bldg.
Vanderpool Co., The, 497-505 W. 22nd St.
Voss, Frederick, 617 to 621 Austin Av.
Winslow Bros. Company, The, 368-408 Carroll Av.

IRON WORK-STRUCTURAL.

Brown Bros. Mfg. Co., 22nd and Campbell Av.
Chicago Bridge & Iron Works, Throop and 105th Sts.
Globe Iron Works, 31-41 Indiana St.
Horn, Wm. Structural Iron Works, 902 to 908 W. Lake St.
Morava Construction Co., 1243 Marquette Bldg.
Scaar, Frank & Co., 92-98 Eleventh St.
Superior Iron Works, 141-143 Ontario St.
Schneider, N. & Co., 403 Fisher Bldg.
Smith, F. P. Wire & Iron Works, 100 Lake St.
Steel Building & Construction Co., 911 N. Ashland Av.
Strobel, C. L., 1744-48 Monadnock Blk.
Vanderpool Co., The, 497-505 W. 22nd St.
Voss, Frederick, 617 to 621 Austin Av.

JAIL AND PRISON BUILDERS.

Bolters, A. Sons, 84 La Salle St.
Globe Iron Works, 31-41 Indiana St.
Halsted, Joseph, 388 W. Randolph St.
Holmes, Pyott & Co., 13 N. Jefferson St.
Smith, F. P. Wire & Iron Works, 100 Lake St.
South Halsted St. Iron Works, 135 Adams St.
Steel Building & Construction Co., 911 N. Ashland Av.
Union Foundry Works, First Nat'l Bank Bldg.
Voss, Frederick, 617 to 621 Austin Av.

KALSOMINE.

Moore, Benjamin & Co., 111-117 N. Green St.
Rubber Paint Company, 154-156 W. Van Buren.

LATH-METAL AND WIRE.

Booth, John, 14 and 16 N. Canal St.
General Fireproofing Co., The, 212 Federal Bldg., Youngstown, Ohio.

Northwestern Expanded Metal Co., Old Colony Bldg.
Roebeling Construction Co., The, 906 Tribune Bldg.
Sykes Steel Roofing Co., 611 S. Morgan St.
Voss, Frederick, 617 to 621 Austin Av.
Wheeling Corrugating Co., 45-47 Lake St.

LATH-WOOD.

DeVries, S. J. & Co., 47th St. near Halsted St.

LAUNDRY DRYERS.

Chicago Clothes Dryer Works, 346-348 Wabash Av.
Nelson & Krueger Co., Spalding Av. and Bloomingtondale Road.
Troy Laundry Machinery Co., 401 Fifth Av.

LAUNDRY MACHINERY.

Chicago Clothes Dryer Works, 346-348 Wabash Av.
Dawson, A. L. & Co., 27-29-31 W. Washington.
Nelson & Krueger Co., Spalding Av. and Bloomingtondale Road.
Troy Laundry Machinery Co., 401 Fifth Av.

LAUNDRY MACHINERY SUPPLIES.

Nelson & Krueger Co., Spalding Av. and Bloomingtondale Road.
Troy Laundry Machinery Co., 401 Fifth Av.

LAUNDRY TRAYS AND KITCHEN SINKS.

Alberene Stone Co., 56 N. Clinton St.

LIME.

Meacham & Wright, 308-09 Chamber of Com.
Schultz, F., 658 S. Halsted St.

LINK BELTING.

Brown Hoisting Machinery Co., The, Cleveland, Ohio.
Jeffrey Mfg. Co., Monadnock Bldg., and Columbus, Ohio.
Link Belt Machinery Co., 39th St. and Stewart Av.
Webster Mfg. Co., 1075 W. 15th St.

LOANS.

Stone, H. O. & Co., 206 La Salle St.

LUMBER.

Chandler Lumber Company, 100 Elston Av.
DeVries, S. J. & Co., 47th St. near Halsted St.
Ensign Lumber Co., The Dexter Bldg., 84 Adams St.
Hines, Edward Lumber Co., Blue Island Av. and Lincoln St.
Paine Lumber Co., Chamber of Commerce.
Pilsen Lumber Co., 22nd and Laflin Sts.
Rittenhouse & Embree Co., 3500 Center Av.
Spry, John Lumber Co., Ashland Av. & 22d St.
Wilce, T. Co., The, 22nd and Throop St.

LUMBER-GEORGIA PINE.

Ensign Lumber Co., The Dexter Bldg., 84 Adams St.

LUMBER-KILN DRIED.

Chandler Lumber Company, 100 Elston Av.
Rittenhouse & Embree Co., 3500 Center Av.
Spry, John Lumber Co., Ashland Av. & 22d St.
Wilce, T. Co., The, 22nd and Throop St.

LUMBER-YELLOW PINE-LONG LEAF.

Ensign Lumber Co., The Dexter Bldg., 84 Adams St.

MACHINISTS.

Allis-Chalmers Company, Chicago.
Brown Hoisting Machinery Co., The, Cleveland, Ohio.
Jackson & Corbett Bridge & Steel Works, 1132 to 1140 The Rookery.
Jeffrey Mfg. Co., Monadnock Bldg., and Columbus, Ohio.
Kaestner, Chas. & Co., 241-261 S. Jefferson St.
Link Belt Machinery Co., 39th St. and Stewart Av.
Webster Mfg. Co., 1075 W. 15th St.
Westerlin & Campbell Construction Co., 53-55 S. Clinton St.
Wolf, Fred W. Co., The, 139 Rees St.

MACHINISTS' AND MANUFACTURERS' SUPPLIES.

Hodge & Homer Co., 47 and 49 W. Randolph.

MANTELS.

Dawson Bros., 197-207 N. Halsted St.
Elman, C. & Co., 1201 W. Superior St.
Edmunds Mfg. Co., Robey St. & Washburn Av.
Hawes & Dodd, 24 Adams St.
Interior Woodworking Co., 296 Wabash Av.
Murphy Marble & Mosaic Co., 3540-3546 Shields Av.

MANTLES-WOOD, BRICK AND TILE.

Dawson Bros., 197-207 N. Halsted St.
Elman, C. & Co., 1201 W. Superior St.
Edmunds Mfg. Co., Robey St. & Washburn Av.
Hawes & Dodd, 24 Adams St.
Interior Woodworking Co., 296 Wabash Av.
Murphy Marble & Mosaic Co., 3540-3546 Shields Av.

MARBLE PRODUCERS.

Verd Antique Marble Co., 1526 Marquette Bldg.

MARBLE WORKERS AND DEALERS.

Dawson Bros., 197-207 N. Halsted St.
Henry Marble Co., 3208 Shields Av.
Marthens, Chester N. Co., 1327 First National Bank Bldg.
Murphy Marble & Mosaic Co., 3540-3546 Shields Av.
Sherman & Flavin, 2511 State St.

MATERIALS-TESTING.

American Bureau of Inspection & Tests, The, 930 Monadnock Bldg.
Wheeler, C. Gilbert, 14 State St.

MASON CONTRACTORS.

Angus Bros. & Co., Security Bldg.
Baldwin, M. E., 1651 Marquette Bldg.
Bulley & Andrews, 411, 115 Dearborn St.
Canham, John, 126 E. Quincy St.
Clark, C. Everett Co., 1015, 100 Washington St.
Cullen, Frank J., 617 Chamber of Commerce.
Eilenberger & Meiling, 84 La Salle St.
Freeman, Hart & Co., Builders & Traders Exc.
Grace, Wm. Company, 1408 Wabash Av.
Garthwait, F. M., 318 Chamber of Commerce.
Gilbert, Harry S., 232 Lunt Av., Rogers Park.
Gindele, Chas. W., Co., 3233 La Salle St.
Griffiths, John & Son, 1009-1011 Merchants Loan & Trust Bldg.
Johnson, F. O., 938 Thome Av.
Lanquist, A., 716-717 Chamber of Commerce.
Leafgreen Bros., 614 Chamber of Commerce.
Ledgerwood, A. J. C., Rooms 516-517, 184 La Salle St.
Mavor, William Co., 167 Dearborn St.
McCarty Brothers, 804, 134 Monroe St.
Morrice & Barron, 125 La Salle St.
Moulton, Geo. M. & Co., Fisher Bldg.
Mueller, Paul P. F., 166 Randolph St.
Mortimer & Tapper, 184 La Salle St.
Peterson, John & Co., Room 32, 122 La Salle St.
Radatz, Jacob, The Rookery.
Schlueter, Henry W., 204 Dearborn St.
Snyder, J. W., 316, 145 La Salle St.
Solmitt, Ralph & Sumner Co., 140 Dearborn St.
Sproul, Elliott W., 312 Chamber of Commerce.
Strandberg, E. P. Company, 159 La Salle St.
Stresenreuter Bros., Chamber of Commerce.
Thompson-Starrett Co., Railway Exc. Bldg.
Thomson, George & Son Co., 145 La Salle St.
Wells Bros. Company, 1014 Monadnock Bldg.

METAL COVERED MOULDINGS.

Chicago Metal Covering Co., 137-139 Fulton St.

METAL CEILINGS.

Bremer & Bielenberg, 1136 W. 13th St.
Knisely Bros., 28th Place and 5th Av.
Wheeling Corrugating Co., 45-47 Lake St.

METAL FURNITURE.

General Fireproofing Co., The, 212 Federal Bldg., Youngstown, Ohio.
Lyon Metallic Mfg. Co., 18-20 S. Ann St.

METAL INTERIOR DECORATIONS.

Illinois Roofing & Supply Co., 23 E. Lake St.

METAL LATH.

Expanded Metal Fire Proofing Co., 790 Old Colony Bldg.
General Fireproofing Co., The, 212 Federal Bldg., Youngstown, Ohio.
Northwestern Expanded Metal Co., Old Colony Bldg.
Wheeling Corrugating Co., 45-47 Lake St.

METAL SASH AND FRAMES.

Bremer & Bielenberg, 1136 W. 13th St.
Knisely Bros., 28th Place and 5th Av.
Sykes Steel Roofing Co., 611 S. Morgan St.
Voigtman & Company, 42-54 E. Erie St.
Yeldham & Keusder, 269 W. Van Buren St.

MILL WORK.

Harty Bros. & Harty Co., 444 W. 21st St.
Pagels, George, Loomis, Bet. 21st St. & 21st Pl.
Paine Lumber Co., Chamber of Commerce.
Russell, P. A., 1131-1133 School St.

MILL AND ELEVATOR SUPPLIES.

Moore & Lorenz, 113-123 S. Clinton St.

MILL WORK—SASH, DOORS AND BLINDS.

Chicago Veneered Door Co., 316 Chamber of Commerce Bldg.
Harty Bros. & Harty Co., 444 W. 21st St.
Pagels, George, Loomis, Bet. 21st St. & 21st Pl.
Russell, P. A., 1131-1133 School St.

MINERAL WOOL.

Chicago Fire Proof Covering Co., 18 N. Canal St.
Watson, H. F. Co., 12-14 S. Clinton St.

MIRRORS AND BEVELED PLATE.

Tyler & Hippach, 88 Randolph St.

MODEL MAKERS.

Rabe, Otto, 16 N. Desplaines St.

MORTAR COLORS.

Kimball, S. S. Brick Co., 304 Cham. of Com.

MOSAICS.

Hawes & Dodd, 24 Adams St.
Henry Marble Co., 3208 Shields Av.
Interior Woodworking Co., 296 Wabash Av.
Marthens, Chester N. Co., 1327 First National Bank Bldg.
Murphy Marble & Mosaic Co., 3540-3546 Shields Av.
Sherman & Flavin, 2511 State St.
Weary & Beck, 1449 Marquette Bldg.

MOULDINGS.

Harty Bros. & Harty Co., 444 W. 21st St.
Moore, Geo. F., 186-188-190 24th St.
Pagels, George, Loomis, Bet. 21st St. & 21st Pl.
Paine Lumber Co., Chamber of Commerce.
Russell, P. A., 1131-1133 School St.

MOULDINGS—DECORATIVE.

Moore, Geo. F., 186-188-190 24th St.

MOULDINGS—INTERIOR.

Moore, Geo. F., 186-188-190 24th St.

MOULDINGS—ROOM.

Moore, Geo. F., 186-188-190 24th St.

MOULDINGS—METAL COVERED.

Chicago Metal Covering Co., 137-139 Fulton St.

NAILS.

Pearson, J. C. Company, Railway Exe. Bldg.

NATURAL GAS FITTING.

Nacey, P. Co., 315-317 Wabash Av.

OATS CLEANER—FOR STABLE USE. OFFICE FITTINGS.

Davis, Reginald J. Co., The, Suite 1451, Railway Exchange Bldg.
Edmunds Mfg. Co., Robey St. & Washburn Av.

ORNAMENTAL IRON RANK AND OFFICE FIXTURES.

Chicago Ornamental Iron Works, 37th St. and Stewart Av.
Hickey, M. H. Wire & Iron Works, 54 Dearborn St.
Smith, F. P. Wire & Iron Works, 100 Lake St.

ORNAMENTAL PATTERNS FOR METAL CASTINGS.

Dux, Joseph, 132 W. Jackson Blvd.

ORNAMENTAL TERRA COTTA.

American Terra Cotta & Ceramic Co., The, 601 Chamber of Commerce Bldg.
Northwestern Terra Cotta Co., The, 1415 Railway Exchange Bldg.

PAINT—CARBON.

Depew & Woodcock Paint Co., 40, 155 Washington St.

PAINT—GRAPHITE.

Lloyd Iron Roofing & Paint Co., The, 99-101 W. Monroe St.
Lucas, John & Co., 55 N. Desplaines St.
Pitkin, Geo. W. Co., Fulton & Carpenter Sts.
Rubber Paint Company, 154-156 W. Van Buren.

PAINT—IRON.

Lloyd Iron Roofing & Paint Co., The, 99-101 W. Monroe St.
Lucas, John & Co., 55 N. Desplaines St.
Pitkin, Geo. W. Co., Fulton & Carpenter Sts.
Rubber Paint Company, 154-156 W. Van Buren.
Vilas Brothers, 227-229 Fifth Av.

PAINT MILLS AND MACHINERY.

Kaestner, Chas. & Co., 241-261 S. Jefferson St.

PAINT, MIXED.

Lucas, John & Co., 55 N. Desplaines St.
Pitkin, Geo. W. Co., Fulton & Carpenter Sts.
Rubber Paint Company, 154-156 W. Van Buren.
Vilas Brothers, 227-229 Fifth Av.
Western Roofing & Supply Co., 177 Randolph.

PAINTS—TESTING.

Wheeler, C. Gilbert, 14 State St.

PAINTERS' SUPPLIES.

Lucas, John & Co., 55 N. Desplaines St.
New Jersey Zinc Co., The, 71 Broadway, New York.
Pitkin, Geo. W. Co., Fulton & Carpenter Sts.
Rubber Paint Company, 154-156 W. Van Buren.
Vilas Brothers, 227-229 Fifth Av.
Western Roofing & Supply Co., 177 Randolph.

PAINTS.

Depew & Woodcock Paint Co., 40, 155 Washington St.

Lucas, John & Co., 55 N. Desplaines St.
Moore, Benjamin & Co., 111-117 N. Green St.
New Jersey Zinc Co., The, 71 Broadway, New York.

Patterson-Sargent Co., The, 2026 Lumber St.
Pitkin, Geo. W. Co., Fulton & Carpenter Sts.
Rubber Paint Company, 154-156 W. Van Buren.

PAINTS—COLD WATER.

Chicago Fire Proof Covering Co., 18 N. Canal St.
Lucas, John & Co., 55 N. Desplaines St.
Pitkin, Geo. W. Co., Fulton & Carpenter Sts.
Rubber Paint Company, 154-156 W. Van Buren.
Western Roofing & Supply Co., 177 Randolph.

PAINTS—ROOFING.

Bird, F. W. & Son, 1434 Monadnock Bldg.
Chicago Fire Proof Covering Co., 18 N. Canal St.
Lucas, John & Co., 55 N. Desplaines St.
McEvoy, Wm. P. & Co., 414 Reaper Block.
Pitkin, Geo. W. Co., Fulton & Carpenter Sts.
Rubber Paint Company, 154-156 W. Van Buren.
Vilas Brothers, 227-229 Fifth Av.

PARQUET FLOORS.

Dunfee, J. & Co., 55 N. Claremont Av.

PATENT MORTISE LOCKS.

Chicago Hardware Co., 40 Dearborn St.

PATTERN MAKERS.

Rabe, Otto, 16 N. Desplaines St.

PHYSICAL LABORATORY.

American Bureau of Inspection & Tests, The, 930 Monadnock Bldg.

Hunt, Robert W. & Co., 1121 The Rookery.

PILES AND CASINGS.

Interlocking Steel Sheet Pile Co., 1132-1140 The Rookery.

PILE DRIVERS.

PIPE AND BOILER COVERING.

Chicago Fire Proof Covering Co., 18 N. Canal St.

Garden City Sand Co., The, 188 Madison St.

Watson, H. F. Co., 12-14 S. Clinton St.

Western Roofing & Supply Co., 177 Randolph.

PIPE AND FITTINGS.

Clow, James B. & Sons, Harrison & Franklin, Davies Warehouse & Supply Co., 20 N. Clark.

PLASTER.

Architectural Decorating Co., 204 Illinois St.

Decorators' Supply Co., The, 215 S. Clinton St.

Plastic Relief Manufacturing Co., The, 298 N. Halsted St.

PLASTER BOARDS.

Mackolite Fireproofing Co., 1401-03 Schiller Bldg.

PLASTER, ORNAMENTAL.

Architectural Decorating Co., 204 Illinois St.

Decorators' Supply Co., The, 215 S. Clinton St.

Plastic Relief Manufacturing Co., The, 298 N. Halsted St.

PLASTERING.

Canham, John, 126 E. Quincy St.

Heidorn, Wm. D. & Co., 1872 N. Ashland Av.

Lennox-Haldeman Co., 184 La Salle St.

McNulty Bros., Railway Exchange Bldg.

Zander-Reum Co., 216 S. Clark St.

PLASTERING CONTRACTORS.

Canham, John, 126 E. Quincy St.

Heidorn, Wm. D. & Co., 1872 N. Ashland Av.

Lennox-Haldeman Co., 184 La Salle St.

McNulty Bros., Railway Exchange Bldg.

Zander-Reum Co., 216 S. Clark St.

PLASTERING LATH.

General Fireproofing Co., The, 212 Federal Bldg., Youngstown, Ohio.

Roebbing Construction Co., The, 906 Tribune Bldg.

Voss, Frederick, 617 to 621 Austin Av.

PLASTERING MATERIAL.

Garden City Sand Co., The, 188 Madison St.

United States Gypsum Co., 184 La Salle St.

PLASTIC CONSTRUCTION.

Plastic Construction Co., The, 1428 Marquette Bldg.

PLASTIC RELIEF.

Architectural Decorating Co., 204 Illinois St.

Decorators' Supply Co., The, 215 S. Clinton St.

Plastic Relief Manufacturing Co., The, 298 N. Halsted St.

Weary & Beck, 1449 Marquette Bldg.

PLUMBING, GASFITTING AND SEWER-AGE.

Conlin, Thomas, Plumbing & Heating Co., 3978 Cottage Grove Av.

Nacey, P. Co., 315-317 Wabash Av.

Roche, James H., 210 31st St.

Wills & Smith, 5338 S. Halsted St.

PORTLAND CEMENT.

Garden City Sand Co., The, 188 Madison St.

Mississippi Valley Portland Cement Co., The, First Nat'l Bank Bldg.

POWER ENGINES.

Allis-Chalmers Company, Chicago.

POWER PLANTS.

Allis-Chalmers Company, Chicago.

Crane, M. H. Estate, 609 Security Bldg.

Graves, W. B., 45 E. Lake St.

Jackson & Corbett Bridge & Steel Works, 1132 to 1140 The Rookery.

Kaestner, Chas. & Co., 241-261 S. Jefferson St.

POWER GENERATORS.

Fairbanks, Morse & Co., Franklin and Monroe, Street, R. R. & Co., 184-186 Washington St.

POWER PUMPS.

Rider-Ericsson Engine Co., 40 Dearborn St.

POWER TRANSMISSION APPLIANCE.

Street, R. R. & Co., 184-186 Washington St.

PREPARED ROOFING MATERIAL.

Chicago Fire Proof Covering Co., 18 N. Canal St.

PRESSURE HEATING.

Davis, G. M. Regulator Co., 144-146 Milwaukee Av.

PULLEYS—STEEL.

Street, R. R. & Co., 184-186 Washington St.

PUMPS.

Dawson, A. L. & Co., 27-29-31 W. Washington.

Fairbanks, Morse & Co., Franklin and Monroe.

Kroeschell Bros. Co., 55 Erie St.

Rider-Ericsson Engine Co., 40 Dearborn St.

PUMPS—AUTOMATIC AND HYDRAULIC.

Kehm Bros. Company, 19 N. State St.

Rider-Ericsson Engine Co., 40 Dearborn St.

PUMPS—CENTRIFUGAL.

Shaw, Willis, 312, 171 La Salle St.

PUMPING ENGINES.

Allis-Chalmers Company, Chicago.

PUMPING MACHINERY.

Kehm Bros. Company, 19 N. State St.

Rider-Ericsson Engine Co., 40 Dearborn St.

PUMPS—SYPHON.

PURIFIERS—WATER.

National Filter Company, Dearborn, Van

Buren Sts. and Custom House Ct.

New York Continental Jewell Filtration Co., 40-42 Quincy St.

RADIATORS.

Arcade Steam Heating Co., 70 La Salle Av.

Clow, James B. & Sons, Harrison & Franklin,

Davies Warehouse & Supply Co., 20 N. Clark,

Kroeschell Bros. Co., 55 Erie St.

Western Valve Co., 41-43 W. Randolph St.

RAILINGS AND GRILLES—BRASS.

Columbian Hardware Co., The, 83 Michigan Av.

Hickey, M. H. Wire & Iron Works, 54 Dearborn St.

REAL ESTATE AND LOANS.

Stone, H. O. & Co., 206 La Salle St.

REFRIGERATING AND ICE MAKING MACHINERY.

Kroeschell Bros. Co., 55 Erie St.

Vilter Mfg. Co., The, Milwaukee, Wis., and Monadnock Bldg., Chicago.

Westerlin & Campbell Construction Co., 53-55 S. Clinton St.

Wolf, Fred W. Co., The, 139 Rees St.

REFRIGERATORS.

Orr & Lockett Hardware Co., 71-73 Randolph.

REGULATORS—DAMPER.

Davis, G. M. Regulator Co., 144-146 Milwaukee Av.

REGULATORS—HEAT, STEAM, AIR, WATER.

Davis, G. M. Regulator Co., 144-146 Milwaukee Av.

Johnson Temperature Controlling Co., 154 Lake St.

Powers Regulator Co., The, 40 Dearborn St.

ROOFING.

Bremer & Bielenberg, 1136 W. 13th St.
Johns-Manville Co., H. W., 173 Randolph St.
Knickerbocker Roofing Company, 3962-68 Cottage Grove Av.
Knisely Co., Harry C., 273 S. Canal St.
Powell, M. W. Co., 204 Dearborn St.
Randolph, C. W., 825 Clifton Av.
Renaud, F. D. & Co., 184 La Salle St.
Standard Roofing Co., 290-294 N. Halsted St.
Western Roofing & Supply Co., 177 Randolph.

ROOFING-ASBESTOS.

Chicago Fire Proof Covering Co., 18 N. Canal St.

ROOFING-CORRUGATED IRON.

Bremer & Bielenberg, 1136 W. 13th St.
Knisely Bros., 28th Place and 5th Av.
Knisely Co., Harry C., 273 S. Canal St.
Lloyd Iron Roofing & Paint Co., The, 99-101 W. Monroe St.
Miller, James A. & Bro., 129 S. Clinton St.
McFarland, J. C. & Co., 27th St. and 5th Av.
McFarson, Joseph T. & Son, 18-22 Milwaukee Av.
Wheeling Corrugating Co., 45-47 Lake St.
Yeldham & Keusder, 269 W. Van Buren St.

ROOFING-GENERAL.

Powell, M. W. Co., 204 Dearborn St.
Renaud, F. D. & Co., 184 La Salle St.
Standard Roofing Co., 290-294 N. Halsted St.

ROOFING-GRAVEL.

Powell, M. W. Co., 204 Dearborn St.
Randolph, C. W., 825 Clifton Av.
Renaud, F. D. & Co., 184 La Salle St.
Sykes Steel Roofing Co., 611 S. Morgan St.
Standard Roofing Co., 290-294 N. Halsted St.

ROOFING MATERIALS.

Garden City Sand Co., The, 188 Madison St.
Johns-Manville Co., H. W., 173 Randolph St.
Powell, M. W. Co., 204 Dearborn St.
Randolph, C. W., 825 Clifton Av.
Renaud, F. D. & Co., 184 La Salle St.
Standard Roofing Co., 290-294 N. Halsted St.
Watson, H. F. Co., 12-14 S. Clinton St.
Western Roofing & Supply Co., 177 Randolph.

ROOFING PAINTS.

Johns-Manville Co., H. W., 173 Randolph St.
Lloyd Iron Roofing & Paint Co., The, 99-101 W. Monroe St.

ROOFING PAPER.

Johns-Manville Co., H. W., 173 Randolph St.
Watson, H. F. Co., 12-14 S. Clinton St.

ROOFING-SLATE AND TILE.

Bremer & Bielenberg, 1136 W. 13th St.
Knisely Co., Harry C., 273 S. Canal St.
Miller, James A. & Bro., 129 S. Clinton St.
McFarland, J. C. & Co., 27th St. and 5th Av.

ROOFING AND SIDING.

Illinois Roofing & Supply Co., 23 E. Lake St.

ROOFING TILE-DEALERS.

Globe Roofing Tile Co., 723, 218 La Salle.

ROOFING TIN.

American Sheet & Tin Plate Co., Pittsburg, Pa.; Rookery Bldg., Chicago; Battery Park Bldg., New York; Union Trust Bldg., Cincinnati; Ainsworth Bldg., Portland, Ore.; Henen Bldg., New Orleans; Equitable Bldg., Denver; Mills Bldg., San Francisco; Security Bldg., St. Louis.

ROOFING-TIN PLATE.

Wheeling Corrugating Co., 45-47 Lake St.

ROOFING-TIN, SLATE, TILE AND METAL.

Bremer & Bielenberg, 1136 W. 13th St.
Knisely Bros., 28th Place and 5th Av.
Knisely Co., Harry C., 273 S. Canal St.
Yeldham & Keusder, 269 W. Van Buren St.

ROLLING PARTITIONS-WOOD AND STEEL.

Dodge, H. B. & Co., 525, 108 La Salle St.

ROPE TRANSMISSION MACHINERY.

Brown Hoisting Machinery Co., The, Cleveland, Ohio.
Jeffrey Mfg. Co., Monadnock Bldg., and Columbus, Ohio.
Kaestner, Chas. & Co., 241-261 S. Jefferson St.
Link Belt Machinery Co., 39th St. and Stewart Av.
Webster Mfg. Co., 1075 W. 15th St.

RUBBING BEDS-MARBLE WORKERS'.

RUBBER-MOULDED.

Goodyear Tire & Rubber Co., Akron, Ohio.

RUBBER GOODS.

RUBBER TILING.

Goodyear Tire & Rubber Co., Akron, Ohio.
RUBBER TILING-FLOORS FOR ELEVATORS AND PUBLIC PLACES.
Goodyear Tire & Rubber Co., Akron, Ohio.

SAFETY DEPOSIT VAULTS.

Chamber of Commerce Safety Vault Co., Chamber of Commerce, 134 Washington St.

SAND.

Garden City Sand Co., The, 188 Madison St.
Knickerbocker Ice Co., 171 La Salle St.
Krug, S., 167 Dearborn St.

SAND AND GRAVEL.

Garden City Sand Co., The, 188 Madison St.
Knickerbocker Ice Co., 171 La Salle St.

SANITARY HOUSE DRAINAGE.

SANITARY PLUMBING AND DRAINAGE. SASH COHD.

Samson Cordage Works, 115 Congress St., Boston, Mass.

SASH, DOORS AND BLINDS.

Harty Bros. & Harty Co., 444 W. 21st St.
Pagels, George, Loomis, Bet. 21st St. & 21st Pl.
Paine Lumber Co., Chamber of Commerce.
Russell, P. A., 1131-1133 School St.
Spry, John Lumber Co., Ashland Av. & 22d St.
Union Interior Finish Co., 53d & La Salle Sts.

SCAGLIOLA.

Henry Marble Co., 3208 Shields Av.

SCALES.

Fairbanks, Morse & Co., Franklin and Monroe.

SCREWS-DOOR AND WINDOW STOPS.

Read, A. P. Company, 14-16 N. Canal St.

SEALED CATCH BASIN AND MAN HOLE COVERS.

SEPARATORS-STEAM AND OIL.

American Engineering Specialty Co., 1510 Monadnock Bldg.

SEWER BUILDERS-PUBLIC AND PRIVATE.

Nacey, P. Co., 315-317 Wabash Av.
Roche, James H., 210 31st St.

SEWER GATE TRAPS.

SEWER PIPE.

Dee, Wm. E., 214 and 215 Royal Ins. Bldg.

SHEATHING PAPER.

Johns-Manville Co., H. W., 173 Randolph St.
Watson, H. F. Co., 12-14 S. Clinton St.

SHELVES-STEEL FOR FACTORIES.

Lyon Metallic Mfg. Co., 18-20 S. Ann St.

SHIELDS FOR TUNNELS.

Interlocking Steel Sheeting Co., 1132-1140 The Rookery.

SHINGLES.

Chandler Lumber Company, 100 Elston Av.

SHINGLES—REDWOOD.

SHINGLE STAINS.

Johns-Manville Co., H. W., 173 Randolph St.
Lucas, John & Co., 55 N. Desplaines St.
Vilas Brothers, 227-229 Fifth Av.

SINKING OF SHAFTS.

Interlocking Steel Sheet Piling Co., 1132-1140 The Rookery.

SIDEWALK BUILDERS.

Blome, Rudolph S. Co., 79 Dearborn St.
Durlacher & MacLachlan, 416, 145 La Salle St.
Gilbert, Harry S., 232 Lunt Av., Rogers Park.
Hoeffler & Co., Chamber of Commerce Bldg.
McEvoy, Wm. P. & Co., 414 Reaper Block.
Peterson, John & Co., Room 32, 122 La Salle St.
Simpson Construction Co., 704 Cham. of Com.

SIDEWALK AND VAULT LIGHTS.

American Luxfer Prism Co., 346 Wabash Av.
Brown Bros. Mfg. Co., 22nd and Campbell Av.

SMOKELESS FURNACES.

Kroeschell Bros. Co., 55 Erie St.

STABLE FIXTURES—WIRE AND IRON.

American Iron & Wire Wks., 575-581 Carroll Av.
Benner Mfg. Co., 110 W. Monroe St.
Booth, John, 14 and 16 N. Canal St.
Hickey, M. H. Wire & Iron Works, 54 Dearborn St.
Smith, F. P. Wire & Iron Works, 100 Lake St.
Voss, Frederick, 617 to 621 Austin Av.

STAIR WORK.

Davis, Reginald J. Co., The, Suite 1451, Railway Exchange Bldg.
Harty Bros. & Harty Co., 444 W. 21st St.

STAIRS AND RAILINGS.

Davis, Reginald J. Co., The, Suite 1451, Railway Exchange Bldg.

STANDPIPES—WATER WORKS.

Chicago Bridge & Iron Works, Throop and 105th Sts.

STAND PIPES.

Benner Mfg. Co., 110 W. Monroe St.
Kroeschell Bros. Co., 55 Erie St.
Schneider, N. & Co., 403 Fisher Bldg.
Smith, F. P. Wire & Iron Works, 100 Lake St.
Voss, Frederick, 617 to 621 Austin Av.

STATUARY—METAL.

Booth, John, 14 and 16 N. Canal St.
Smith, F. P. Wire & Iron Works, 100 Lake St.
Winslow Bros. Company, The, 368-408 Carroll Av.

STATUES.

STEAM BOILERS.

Allis-Chalmers Company, Chicago.
Kewanee Boiler Company, 167 Lake St.

STEAM BOILER FURNACES.

STEAM ELEVATORS.

Eaton & Prince Co., 70-76 Michigan St.
Otis Elevator Company, 159 La Salle St.
Reedy, J. W. Elevator Mfg. Co., 91 Illinois St.

STEAM ENGINES AND BOILERS.

Fairbanks, Morse & Co., Franklin and Monroe.

STEAM FITTERS' MATERIAL.

Davis, G. M. Regulator Co., 144-146 Milwaukee Av.

STEAM FITTERS AND MACHINISTS.

Crane, M. H. Estate, 609 Security Bldg.
Douglas, Thos. J. & Co., 52 Dearborn St.
Kroeschell Bros. Co., 55 Erie St.
Pope, William A., 79 Lake St.
Simmons, C. H., 218 La Salle St.

STEAM GENERATORS.

Kewanee Boiler Company, 167 Lake St.
Wilks, S. Mfg. Co., 35th St. & Shields Av.

STEAM HEATING APPARATUS.

Crane, M. H. Estate, 609 Security Bldg.
Conlin, Thomas, Plumbing & Heating Co., 3978 Cottage Grove Av.

Clow, James B. & Sons, Harrison & Franklin.
Davies Warehouse & Supply Co., 20 N. Clark.
Davis, G. M. Regulator Co., 144-146 Milwaukee Av.
Davis Construction Co., 41 Dearborn St.
Deppmann, A. & Co., 212 Illinois St.
Dilzer, Fred, 48 Dearborn St.
Douglas, Thos. J. & Co., 52 Dearborn St.
Graves, W. B., 45 E. Lake St.
Ideal Heating Company, 414 W. 63rd St.
Kehm Bros. Company, 19 N. State St.
Kirk, Geo. H., 5319 Wentworth Av.
Kroeschell Bros. Co., 55 Erie St.
Norton, F. J., 8 North State St.
Phillips-Getschow Co., 184 Indiana St.
Pope, William A., 79 Lake St.
Simmons, C. H., 218 La Salle St.
Thomas & Smith, 17-19 S. Carpenter St.

STEAM PUMPING MACHINERY.

Fairbanks, Morse & Co., Franklin and Monroe.

STEAM TRAPS.

Western Valve Co., 41-43 W. Randolph St.

STEEL PLATE BLOWERS.

Andrews & Johnson Co., 256 Washington Bldg.
New York Blower Co., 25th Pl. & Stewart Av.

STEEL ROLLING DOORS, SHUTTERS AND PARTITIONS.

Dodge, H. B. & Co., 525, 108 La Salle St.
Kinneear Mfg. Co., The, 112 Clark St.
Smith, F. P. Wire & Iron Works, 100 Lake St.
Voss, Frederick, 617 to 621 Austin Av.

STEEL TANKS.

Chicago Bridge & Iron Works, Throop and 105th Sts.

STEEL—WATER STORAGE.

Chicago Bridge & Iron Works, Throop and 105th Sts.

STIRRUPS.

Columbian Hardware Co., The, 83 Michigan Av.

STONE—BRIDGE.

Bedford Quarries Co., The, Room 638, 204 Dearborn St.
Cleveland Stone Co., 204 Dearborn St.
Edwards & Ward, Fullerton Av. Bridge.
Perry-Matthews-Buskirk Stone Co., Monadnock Block.

STONE—BUILDING.

Bedford Quarries Co., The, Room 638, 204 Dearborn St.
Cleveland Stone Co., 204 Dearborn St.
Edwards & Ward, Fullerton Av. Bridge.
Perry-Matthews-Buskirk Stone Co., Monadnock Block.
Rawle, John 507 Chamber of Commerce.

STONE DEALERS.

Bedford Quarries Co., The, Room 638, 204 Dearborn St.
Cleveland Stone Co., 204 Dearborn St.
Perry-Matthews-Buskirk Stone Co., Monadnock Block.

STONE DEALERS—IN ROUGH AND SAWED STONE.

Buscher & Gast, 3333 N. Clark St.
Chicago Cut Stone Co., 3403 La Salle St.
Edwards & Ward, Fullerton Av. Bridge.
Rawle, John 507 Chamber of Commerce.

STOP SCREWS AND WASHERS.

Read, A. P. Company, 14-16 N. Canal St.

STOVES AND RANGES.

Detroit Stove Works, 2921 to 2933 S. La Salle St., Chicago, Ill.

STRUCTURAL IRON AND STEEL.

Bolters, A. Sons, 84 La Salle St.
Chicago Bridge & Iron Works, Throop and 105th Sts.
Globe Iron Works, 31-41 Indiana St.
Holmes, Pyott & Co., 13 N. Jefferson St.
Illinois Steel Company, 50 Wabasha Av.
Morava Construction Co., 1243 Marquette Bldg.
Smith, F. P. Wire & Iron Works, 100 Lake St.
South Halsted St. Iron Works, 135 Adams St.
Union Foundry Works, First Nat'l Bank Bldg.

STRUCTURAL IRON WORK DESIGNERS.

Chicago Bridge & Iron Works, Throop and 105th Sts.

SURETY BONDS FOR CONTRACTORS

Burrows, D. W. & Co., 164 La Salle St.

SURVEYORS—CITY AND COUNTY.

Greeley-Howard Co., 822, 112 Clark St.

SURVEYORS' SUPPLIES.

Dietzgen, Eugene Co., 181 Monroe St.
Kenfelf & Esser Co., 111 Madison St.

TANKS—NICKEL PLATERS.

Alberene Stone Co., 56 N. Clinton St.

TANKS—IRON AND STEEL.

Chicago Bridge & Iron Works, Throop and 105th Sts.

Fairbanks, Morse & Co., Franklin and Monroe, Kaestner, Chas. & Co., 241-261 S. Jefferson St. Kewanee Boiler Company, 167 Lake St.

Kroeschell Bros. Co., 55 Erie St.
Schneider, N. & Co., 403 Fisher Bldg.
Wilks, S. Mfg. Co., 35th St. & Shields Av.

TEMPERATURE REGULATION.

Johnson Temperature Controlling Co., 154 Lake St.

Powers Regulator Co., The, 40 Dearborn St.

TERRA COTTA.

American Terra Cotta & Ceramic Co., The, 601 Chamber of Commerce Bldg.

Northwestern Terra Cotta Co., The, 1415 Railway Exchange Bldg.

THERMOSTATS.

Johnson Temperature Controlling Co., 154 Lake St.

Powers Regulator Co., The, 40 Dearborn St.

TILE—FLOORS.

Dawson Bros., 197-207 N. Halsted St.

Hawes & Dodd, 24 Adams St.

Illinois Mosaic Tile Co., 569 Loomis St.

Marthens, Chester N. Co., 1327 First National Bank Bldg.

Murphy Marble & Mosaic Co., 3540-3546 Shields Av.

Sherman & Flavin, 2511 State St.

Weary & Beck, 1449 Marquette Bldg.

TILE—WALL.

Dawson Bros., 197-207 N. Halsted St.

Hawes & Dodd, 24 Adams St.

Marthens, Chester N. Co., 1327 First National Bank Bldg.

Murphy Marble & Mosaic Co., 3540-3546 Shields Av.

Sherman & Flavin, 2511 State St.

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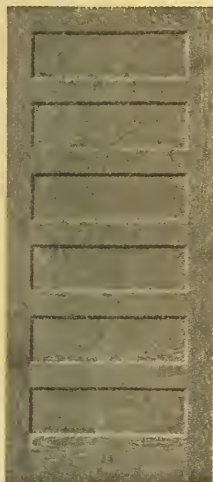
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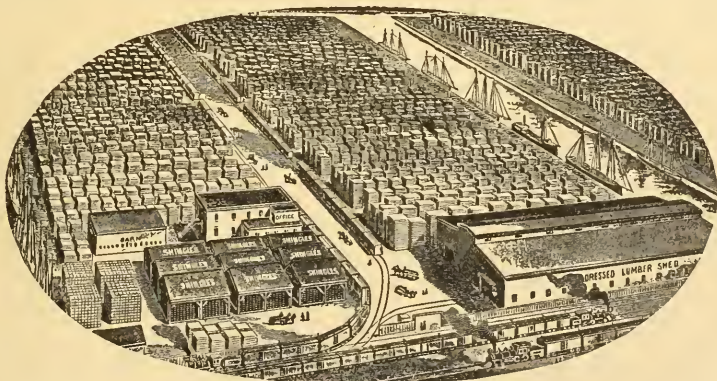
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